Global Surgery – Socioeconomic and Geographic Maldistribution of Surgical Resources

by

Dr Angela June Dell

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Supervisor: Professor D Kahn

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Department of Surgery

DECLARATION

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ABSTRACT

Surgery is an indispensable part of any health system and improving access to safe surgery remains a challenge in the developing world. Surgery is emerging as a priority in global health, unfortunately information around the burden of surgical diseases or the available surgical resources is limited. South Africa is an Upper Middle Income Country (UMIC) and currently provides reasonable surgical services, however these services vary across regions, between urban and rural settings, as well as between public and private hospitals. There is no reliable data regarding the available surgical resources in South Africa, namely surgical beds, operating theatres and surgeons. These variables are essential in developing a National Surgical Plan to address the burden of surgical disease, however they are limited in the information they provide they provide regarding surgical capacity and need to be assessed in context with more robust indicators.

This aim of this study was to quantify some of the specific surgical resources as identified by the World Health Organization (WHO) and the Lancet Commission. This research will contribute to the growing body of research regarding global surgery in South Africa and attempt to provide an analysis of metrics used to evaluate surgical systems. The research hypothesis was that the surgical resources in South Africa were limited, and that surgeons, theatres and hospital beds per capita are inadequate compared to developed countries and do not meet global recommendations. This involved a descriptive analysis of surgical resources and included the total number of hospitals, of hospital beds, the number of surgical beds, the number of general surgeons (specialist and non-specialist), and the number of functional operating theatres in South Africa. The surgical resources were analysed, both according to province and district, and a comparison was performed based on the population density.

A comparison of the public and private facilities was undertaken with regard to the total numbers, as well as per population density. Lastly, a comparison was performed with other high and low income countries around the world.

The results showed one hospital per 100 000 population, 186.64 hospital beds, 41.55 surgical beds, 1.78 specialist general surgeons, 2.90 non-specialist general surgeons, and 3.59 operating theatres per 100 000 people in South Africa. These numbers fell far below international recommendations, as well as developed countries such as the United Kingdom (UK) and United States of America (USA). Surgical resources were concentrated in metropolitan areas, and there were differences between the public and private sectors, with private hospitals having a greater number of surgical beds and operating theatres per population than public hospitals.

These data indicated how surgical providers and basic infrastructure were distributed in South Africa, which will allow more accurate planning by government policymakers. Recommendations need to be tailored according to each sector as the needs of the patients and resources available are different. There is a need to acknowledge the major shortage of health-care providers with implementation of the National Health Insurance (NHI). There is a need for validated instruments to accurately collect data and for reliable electronic information sharing which will improve data collection and analysis between rural and urban areas. Existing resources need to be utilized more effectively. These results showed that regional hospitals lack both specialist and non-specialist general surgeons. The international consensus was that performing surgery at district level hospitals improved access and lowered cost, however this will need recruitment of additional skilled personnel and infrastructure in order to support surgery at this level.

This national audit has provided much needed data on the some of the available surgical resources may influence critical decision-making about funding distribution, resource and training post allocations, as well as address inequalities in service delivery.

Supervisor: Professor Delawir Kahn Authour: Dr Angela Dell

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DEDICATION

I dedicate this thesis to my father Michael Dell, and to my late and brilliant mother Theresa Dell who taught me to strive for excellence since childhood.

To my sister Linda Drummond, you are an encouragement and a role-model and I am truly grateful to you.

Lastly to my unwavering and patient husband Adrian Swan, this humble work is a sign of gratitude for your dedicated partnership to success in my life.

ABBREVIATIONS

ACS - American College of Surgeons

ACS HPRI – American College of Surgeons Health Policy Research Institute

ASGBI - Association of Surgeons of Great Britain and Ireland

ASSA – Association of Surgeons of South Africa

BOSD - Burden of Surgical Disease

CMSA – College of Medicine of South Africa

COSECSA - College of Surgeons of East, Central and Southern Africa

DALYs – Disability Adjusted Life Years

DBSA - Development Bank of Southern Africa

DCP – Disease Control Priorities

DCP 2 – Disease Control Priorities, 2nd Edition

DCP 3 – Disease Control Priorities, 3rd Edition

DHB – District Health Barometer

DHS - Demographic and Health Surveys

DNHPD - Department of National Health and Population Development

EC – Eastern Cape

FCS - Fellowship of the College of Surgeons

FS – Free State

GBDWG - Global Burden of Disease Working Group

GDP – Gross Domestic Product

GIEESC - WHO Global Initiative for Essential and Emergency Surgery Care

GP – Gauteng Province

GP – General Practitioner

HASA - Hospital Association of South Africa

HIV – Human Immune-deficiency Virus

HNYB - Hospital and Nursing Yearbook of South Africa

HPCSA – Health Profession's Council of South Africa

HST – Health Systems Trust

ICD-10 – International Classification of disease (10^{th} Edition)

ICES - International Collaboration for Essential Surgery

ICU – Intensive Care Unit

IMR – Infant Mortality Rate

IO - International Organizations

IQR – Interquartile range

KZN – KwaZulu-Natal

LMIC – Lower Middle Income Country

LP – Limpopo Province

LCoGS – Lancet Commission on Global Surgery

MCS - Membership of the College of Surgeons

MMed – Master of Medicine

MMR – Maternal Mortality Rate

MP – Mpumalanga Province

NC – Northern Cape

NGO - Non-Governmental Organizations

NHI – National Health Insurance

NW – North West

PERSAL – Personal and Salary system

PIPES - Personnel, Infrastructure, Procedures, Equipment and Supplies tool

PVO - Private Volunteer Organizations

RSA – Republic of South Africa

RWOPS – Remunerated Work outside Public Service

SA – South Africa

SAMJ – South African Medical Journal

SARA - Service Availability and Readiness Assessment

SDG - Sustainable Development Goals

SEQ – Socio-Economic Quintile

SP – Specialist

STATS SA – Statistics South Africa

UCES - Universal Coverage of Essential Surgery

UHC – Universal Health Coverage

UK – United Kingdom

UMIC – Upper Middle Income Country

UN – United Nations

UNICEF – United Nations Children's Emergency Fund

WC – Western Cape

WHO - World Health Organization

DEFINITION OF TERMS

Bellwether procedures: The Lancet Commission has proposed the use of three Bellwether procedures which are markers of system functioning, viz. caesarean section, management of open fractures and laparotomy. The performance of these procedures suggest a level of complexity advanced enough to do most other surgical procedures.

Central referral hospital (tertiary three): In a very small number of hospitals, currently two, there will be an additional package of subspecialties (Group 3 Specialties in Table 1). These will be referred to as tertiary three hospitals, also called Central Referral Hospitals.

Disability adjusted life years (DALY): The disability adjusted life year (DALY) is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death. This can be calculated as the YLL (years of life lost) and the YLD (years lived with disability). These data are obtained from DALY curves generated form age-specific population based data.

District hospital (level one): This is the first level of referral and generalist staff are available with access to basic diagnostic and therapeutic services, such as X-rays (provided radiographers are available) and basic laboratory tests. It should have a functional operating theatre in which operations are performed regularly under general anaesthesia (although not performed by specialist anaesthetist). There would be no intensive care unit. Generalists from a range of clinical disciplines provide the services. According to the World Health Organisation's functional definition, district hospitals should provide diagnostic, treatment, care, counselling and rehabilitation services. It should cover the following clinical disciplines at generalist level: Family Medicine and Primary health care, Medicine, Obstetrics, Psychiatry, Rehabilitation, Surgery, Paediatrics and Geriatrics.

District hospitals are categorized into small, medium and large district hospitals with the following number of beds: (a) small district hospitals with no less than 50 beds and no more than 150 beds; (b) medium size district hospitals with more than 150 beds and no more than 300 beds; and (c) large district hospitals with no less than 300 beds and no more than 600 beds.

District municipality: The nine provinces of South Africa are divided into 52 districts, which are either metropolitan or district municipalities. They are the second level of administrative division, below the provinces and (in the case of district municipalities) above the local municipalities. As a consequence of the 12th amendment of the Constitution in December 2005, which altered provincial boundaries, the number of districts was reduced from 53. Another effect of the amendment is that each district is now completely contained within a single province, thus eliminating cross-border districts. The districts also cover the entire area of the continental republic.

Essential surgical care: Any and all procedures, contextually and culturally dependent, that are deemed by that region, society, or culture to promote individual and public health, wellbeing, and economic prosperity. The Bellwether Procedures—caesarean delivery, laparotomy and open fracture treatment—serve as a proxy for surgical systems that have the ability to provide a broad range of procedures.

A **General level three hospital** will have sub-specialty representation in at least 50% of the range of the Group 1 specialties (Table 1). A specialised level three hospital will only have one or two specialities from groups 1, 2 or 3 represented (e.g. cardiology and anaesthetics).In the public sector, these hospitals are defined as **Tertiary one hospitals** (also called Provincial Tertiary hospitals).

Global surgery is an area of study, research, practice, and advocacy that seeks to improve health outcomes and achieve health equity for all people who require surgical care, with a special emphasis on underserved populations and populations in crisis. It uses collaborative, cross-sectoral, and transnational approaches and is a synthesis of population-based strategies with individual surgical and anaesthesia care.

Infant mortality rate: The number of deaths of infants under one year old per 1 000 live births. This rate is often used as an indicator of the level of health in a country.

Lower and middle income countries (LMICs): Economies are divided according to 2013 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income (LIC), $1,045 or less; lower middle income (LMIC), $1,046 - $4,125; upper middle income (UMIC), $4,126 - $12,745; and high income (HIC), $12,746 or more. South Africa is classified as an UMIC.

Maternal mortality rate: Maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes. It is expressed as a ratio per 100 000 live births.

National referral hospital (tertiary two): Some Tertiary one hospitals will also provide a defined range (package) of other specialised services (Group 2 specialties in table 1). These are classified as Tertiary 2 hospitals and are also called National Referral Hospitals.

Personal and salary system: The Personal and Salary System (PERSAL) is the central system used for the administration of the public service payroll.

Private hospital: A private hospital is a hospital owned by a for-profit company or a non-profit organisation and privately funded through payment for medical services by patients themselves, by insurers, or by foreign embassies.

Public hospital (provincial): A health care institution owned by a federal, state, or local government.

Regional hospital (level two): Regional hospitals are level two facilities that provide care requiring the intervention of specialists and general practitioners. A hospital providing a single specialist service would be classified as a specialised level 2 hospital. A general level two hospital would need to provide and be staffed permanently in at least five of the following eight basic specialties: surgery, medicine, orthopaedics, paediatrics, obstetrics and gynaecology, psychiatry, diagnostic radiology and anaesthetics. A regional hospital has between 400 and 800 beds.

Semi-private hospital: This type of hospital is associated with hospital service that gives patient more privileges than a ward patient but less than a private patient.

Specialised hospital: There are wide a range of possible specialties that could be focused in a hospital. Two common specialised hospitals catering for high incidence chronic conditions that are found nationally are: psychiatric hospitals that provide long term in-patient care for patients with chronic psychiatric conditions and TB hospitals that provide long term in-patient care for patients with chronic TB. It has a maximum of 600 beds.

Surgical condition: This has not been consistently defined but can be seen as any disease state requiring the expertise of a surgically trained provider. A surgical condition may be more broadly defined as ‘‘any condition for which the most potentially effective treatment is an intervention that requires suture, incision, excision, manipulation, or other invasive procedure that usually, but not always, requires anaesthesia.’’

Surgical workforce: A network of associated surgical and anaesthetic personnel who work in concert to deliver surgical care. This includes but is not limited to all surgical and anaesthetic providers, nurses, pathologists, radiologists, laboratory technicians, theatre managers, community health workers, rehabilitation specialists, biomedical technicians, and engineers.

Tertiary hospital (level three): These hospitals receive patients from, and provide sub-specialist support to a number of Regional Hospitals. Most of the care should be level three care that requires the expertise of clinicians working as sub-specialists or in rarer specialties (e.g. within surgery for example, sub-specialties such as urology, neurosurgery, plastic surgery and cardiothoracic surgery). It has a maximum of 1 200 beds.

Table 1: Specialities classified as level three services.

Group 1 specialities	*Group 2 specialities*	*Group 3 specialities*
Anaesthetics	Cardiology	Hepatology
Burns	Cardiothoracic Surgery	Liver transplant
Clinical Pharmacology	Clinical Immunology	
Critical care and ICU	Craniofacial surgery	
Dermatology	Endocrinology	
Diagnostic radiology	Geriatrics	
Ear nose and throat	Haematology	
Gastroenterology	Human genetics	
Infectious diseases	Medical and radiation oncology	
Mental health	Neurology	
Neonatology	Neurosurgery	
Nephrology	Nuclear medicine	
Obstetrics and gynaecology	Paediatric sub-specialities	
Ophthalmology	Renal transplant	
Orthopaedics	Rheumatology	
Paediatric medicine	Spinal injuries	
Paediatric surgery		
Paediatric ICU		
Plastic and reconstructive surgery		
Rehabilitation centre		
Respiratory medicine		
Trauma		
Urology		
Vascular surgery		

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Chapter 1: Overview

Surgery is an indispensable part of any health system and improving access to safe surgery remains a challenge in the developing world. Understanding the surgical burden of disease is possible through population based epidemiological studies and some research is already underway through various networks. Surgery has emerged as a priority in global health, unfortunately information around available surgical resources are limited. This research will contribute to the growing body of knowledge regarding global surgery in South Africa and attempt to provide an analysis of metrics used to evaluate surgical systems.

1.1 Background of the Problem

The World Health Organization (WHO) estimated that the Burden of Surgical Disease (BoSD) will rise dramatically by 2030. There is little research around this burden in the developing world, and further insight is needed into this problem, particularly in low and middle income countries (LMIC). [1] The Disease Control Priorities Project (DCP3) estimated that more than 30% of the disability adjusted life years (DALY's) were from conditions which may be surgically treated. [1, 2] This Global Burden of Disease (GBD) comprised of injuries (38%), malignancies (19%), congenital anomalies (9%), complications of pregnancy (6%), cataracts (5%) and perianal conditions (4%). Almost one third of injury-related mortality affected 15 to 44 year-olds, the most economically productive segment of the population. Many of these deaths could be prevented by access to surgical services. [2, 3]

The Lancet Commission on Global Surgery 2030 report estimated that without the urgent upscaling of surgical care, LMICs will have a projected economic loss of $12.3 trillion dollars, reducing the annual income growth by as much as 2% in some countries. [9] In the absence of surgical services, common conditions such as appendicitis, fractures and complicated labour would result in high mortality rates.

Historically, the global health community did not focus its efforts on surgical care because it was perceived as being excessively expensive. There was a fear that if surgical programs were supported, it would divert resources away from more cost-effective population-based programs. [6] Other factors may have played a role, such as the lack of convincing data that there was a significant burden of disease and the assumption that surgery was too complex to deliver. It was estimated that more than 11%, and perhaps even as high as 32% of the global burden of disease could be treated with surgery. [1, 2, 9] Although there was international consensus in the diagnosis and management of most surgical diseases (i.e. appendicitis), there tended to be a wide variation in the cultural acceptance of a standard provision of treatment (i.e. appendectomy) and follow-up. In addition, there have been disagreements as to how to bring about system change. There was limited information on surgical provision in LMICs according to the world's literature. [15] Estimation of the surgical burden would be futile without the investigation into existing surgical infrastructure and available resources already in place. This is a starting point in countries where limited data exists.

Contributing to this global crisis is the lack of comprehensive data to begin the process of health systems strengthening. The healthcare infrastructure in many LMICs is inadequate and challenges not only surgical delivery, but also the collection and evaluation of data pertinent to understanding the unmet surgical need and surgical outcomes. [6] The WHO situational analysis tool identified strengths and weaknesses as well as gaps in infrastructure, human resources, surgical innovations, and equipment, and is now used in around 138 countries. [25]

The analysis tool proposed six surgical metrics designed specifically to capture facility-level data on structural issues (number of operating rooms, number of accredited surgeons, number of accredited anaesthesia professionals), process issues (volume of surgery), and outcomes (post-operative death ratios) [9]. The tool was simple and provided a brief snapshot of the capacity of hospitals to provide surgical care. This tool was not specifically used for data collection, however, it does indicate that variables that were being analysed were internationally relevant.

The Lancet Commission began to address the gaps in the human and economic effects of surgical conditions, the state of surgical care, and the potential strategies for the upscale of surgical services in LMICs. The Commission brought together an international, multidisciplinary team of 25 commissioners, supported by advisors and collaborators from more than 110 countries and six continents. [9] Surgery, like any other international development program, required careful impact assessment.

Health metrics measure the effectiveness of interventions and the health system in general. These metrics are gaining importance as a means of evaluating the broader impact of public health programs, especially given the health reforms being implemented by many countries. [30] Because traditional public health indicators, such as maternal mortality and under-five mortality, may not capture the full impact of surgical care on population health, specific surgical indicators must be developed. Monitoring and evaluation has several important benefits, including its ability to assess whether the program is having its desired effect. This information allows surgeons and administrators to identify and improve upon weaknesses in the healthcare delivery system, resulting in better patient care. This assessment also provides effectiveness data to stakeholders. With proper reporting, funders may be confident in the reach of their investment, governments can place their trust in the organization, and patients can be rest assured that their doctors are delivering quality care.

According to the World Bank, the WHO and UNICEF, surgical indicators are lacking. The Lancet Commission recommend that their six core surgical indicators should be tracked and reported by all countries. [9] Global health organisations, such as the World Bank recommend the World Development Indicators, while the WHO recommend the Global Reference List of 100 Core Health Indicators. Other entities suggest tracking the 2015 Sustainable Development Goals (SDGs).

One of the Lancet indicators included the assessment of specialist workforce density with a recommendation to have at least 20 surgical, anaesthetic and obstetric providers per 100 000 people, in 100% of countries by 2030. [9] Other indicators included access to timely surgery, surgical volume, perioperative mortality and protection against impoverishing expenditure.

A template for a National Surgical plan has been proposed by the Lancet Commission, and involves infrastructure (tracking number of facilities), workforce (density and distribution of surgical, anaesthetic and obstetric specialists), service delivery (Bellwether procedures), financing, and information management (robust information systems). [9] Of particular relevance to this research, were the first two. By tracking the number and distribution of surgical facilities as well as mapping surgical providers, these crucial data can be directed towards the development of a National Surgical Plan aimed at dealing with the global burden of surgical disease. Data collection, analysis, and reporting of a limited set of indicators, can focus attention and rouse support for surgery.

Several studies have found that many surgical interventions are cost-effective in resource poor settings. [7, 18, 30] If left unaddressed surgical disorders are likely to comprise more than two-thirds of the global years of life lost in 2025. Surgical services in district hospitals in sub-Saharan Africa and south Asia were the most cost-effective, with the best estimates per DALY averted ranging between US$33 and US$38. [7] Cost-effectiveness is greatest in these regions because the cost of infrastructure and personnel is low and because the disease burden is high.

Understanding the baseline surgical and anaesthetic capacity in a country, with appropriate metrics, is critical to improving the quality of services and outcomes. The human resources are the backbone of health-care delivery systems. The lack of human resources in developing countries often is the greatest challenge to providing surgical care. Thus, simply funding and providing equipment will not completely address the surgical disparities which exist between low and high income countries. Africa has less than 1% of the surgical work force in comparison to the United States, and a significantly greater share of the burden of disease. [4]

Major shortages in the surgical workforce are compounded by maldistribution of the existing workforce resulting in gross inequity. LMICs are disproportionately affected by low surgical workforce density, and in particular, people living in rural areas, those with a low income, and those who are marginalised are the most affected by these shortages. [9] A WHO report published in 2006 identified a threshold of 228 skilled health care professionals per 100 000, below which countries were unable to reach essential health targets and were deemed to be in health workforce crisis. Updates described 83 countries which were still below this threshold. [34] However, the data collected did not address how specialty-specific providers were distributed within each country. This uncertainty has prevented accurate assessment of surgical workforce needs and hampered workforce planning at both national and international levels.

In a recent systematic review of the number of surgeons, obstetricians and anaesthetists in LMICs, only 6 of 42 countries provided relevant countrywide statistics. [41] To date, the numbers of surgical providers or surgical infrastructure have not been recorded or published in national health sector reviews or official country reports, according to the WHO. Data fields on basic and comprehensive surgical services, infrastructure and workforce have only recently been included in the WHO Service Availability and Readiness Assessment (SARA) questionnaire (WHO 2014a) and the Demographic and Health Surveys (DHS), and it will take several years before this information becomes available. [41]

Of the 47 countries in sub-Saharan Africa, 38 do not meet the WHO recommended minimum of 20 doctors and 100 nurses per 100 000 population, or the surgical specialities combination required to deal with the burden of surgical diseases. [47]

Adequate facilities are crucial to the provision of basic surgical care. Even the best trained and motivated surgical team cannot function without appropriate infrastructure. [48] Little is known about the substantial surgical shortages in south Asia and sub-Saharan Africa with respect to the availability of surgical facilities, staff and equipment levels. [42] Funk et al estimated the global distribution of operating theatres by extrapolating data from 769 hospital profiles in 92 countries.

The study showed that total number of theatres was not publicly reported by each country and there were inconsistent reports from countries regarding hospital beds, making it impossible to postulate about optimum number of theatres for a particular sub-region. They recommended that the surgical workforce and infrastructure should be described and studied on a global level in order to quantify the disparity between resources in rich and poor countries. [43]

The only South African study looking at health facility distribution, bed number and density was published in the *South African Medical Journal* in 1995. [65] Chetty performed an analysis of the distribution of health facilities in order to assist in the development of a comprehensive National Health Plan. This study helped define the landscape for the health facility distribution 20 years ago. However, much has changed since then and no similar analysis has been published. It is evident regarding the importance of surgical data and surgical system indicators such as those outlined by the WHO situational analysis tool and Lancet indicators, that more recent and accurate data is needed in order to contribute to a national database, as well as towards of a global database of surgical capacity.

A National Health Insurance (NHI) scheme has been proposed by the current South African government which offers universal health coverage for all. Van der Berg et al have provided a comprehensive overview of the proposal and its feasibility. [69] They found that current healthcare worker estimates as reported by the WHO, grossly overestimated the numbers which were currently practising, and suggested a deficit of between 7 000 and 17 000 specialists which would be needed in order to implement the proposed NHI. Their data were extrapolated from various sources and more accurate estimates of workforce numbers are needed.

1.2 Statement of the Problem

South Africa is categorized as an UMIC according to the World Bank, and it currently provides reasonable surgical services. These services vary across the various regions, between urban and rural settings, as well as between public and private hospitals. There is no reliable data with regard to the available surgical resources in the various hospitals in South Africa, namely surgical beds, theatres and surgeons. These variables are essential in developing a National Surgical Plan to address the burden of surgical disease. In addition, there is no data on the differences between the hospitals or the public and private sectors.

1.3 Purpose of the Study

This aim of this study was to quantify some of the specific surgical resources as identified by the WHO Safe Surgery Saves Lives campaign, as well as the Lancet Commission on Global Surgery. An attempt has been made analyse some of these indices through a review of their strength and limitations and to provide a framework for further research in this area.

1.4 Theoretical Framework

The Lancet Commission on Global Surgery comprised an international multi-disciplinary group of 25 Commissioners, in collaboration with collaborators in over 110 countries. [9] Global Surgery 2030: Evidence and Solutions for Achieving Health, Welfare, and Economic Development was published by the Lancet Commission team and aimed to provide a template for developing a National Surgical Plan. Core components of the plan were 1) Infrastructure, 2) Workforce, 3) Service delivery, 4) Financing, and 5) Information management. Each of these components had specific recommendations and assessment methods which would need to be in place for effective implementation of a National Surgical Plan.

By evaluating some of the surgical resources in South Africa, an assessment of infrastructure and surgical workforce could be established. The limitations of some of the current metrics being used could (bed numbers) could be established. In collaboration with key stakeholders within government, it would be possible to contribute to a global database of surgical capacity, as well as make recommendations that could influence a National Surgical Plan. This would hopefully translate into the provision of safe and affordable surgical care to those in need.

1.5 Research Hypothesis

The research hypothesis is that some surgical resources in South Africa are limited, and that surgeons, theatres and hospital beds per 100 000 are inadequate compared to developed countries and do not meet global recommendations. Importantly, these indices are limited in the information they provide regarding surgical capacity.

1.6 Importance of the Study

This large-scale national audit will provide much needed data on the some available surgical resources and would allow stakeholders and policy makers to implement public health policies which better cater for the surgical needs of patients. This in turn may influence critical decision making about funding distribution, resource and training post allocations, as well as focus on inequalities in service delivery. Crucial to infrastructure planning, training and funding from international donors is the ability to reliably estimate the scope of surgical disease in the developing world.

1.7 Summary

Surgery is an indispensable part of any health system and improving access to safe surgery remains a challenge in the developing world. Surgery is emerging as a priority in global health and unfortunately there is limited data about the burden of surgical diseases or the surgical resources in place to deal with this burden. This research will begin to address the latter and hopefully lay the foundation for future research to determine the burden of surgical disease. It will also examine some of the limitations of assessing infrastructure in isolation as a means of evaluating surgical capacity.

Chapter 2 comprised an overview of existing literature regarding the emerging field of global surgery. It provided a summary of what was currently known about the burden of surgical disease, as well as current recommendations regarding surgical indicators. The paucity of global data, particularly in developing countries, was examined. Data highlighting the cost-effectiveness of surgical treatment was emphasized and the negative consequences of a lack of surgical resources were mentioned. Surgical workforce, task-shifting and surgical infrastructure in the developing world were summarized. Lastly, what little research regarding South African surgical resources, as well as the proposed National Health Insurance scheme and its obvious shortcomings, were discussed.

Chapter 2: Literature Review

Surgery – 'the neglected step-child of public health'

Surgery has been previously neglected as a development issue, despite the obvious effect of surgical illnesses on morbidity and mortality. Surgical conditions lead to premature death and disability resulting in a massive economic burden, which if left unmanaged could cripple the global economy.

Recently, greater attention has been given to surgical services, as there is growing evidence of cost-effectiveness of surgical interventions, a significant volume and burden of surgical disease, as well as global disparities in surgical care. [1, 2, 3] The significant and preventable morbidity and mortality from surgical conditions has prompted leading experts in public health to refer to surgery as the "neglected stepchild" [4] of global health, and others to point out the essential role of surgical services in meeting the 2015 Millennium Development Goals. [3, 5]

The Millennium Development Goals, developed by the United Nations (UN), outlined inequalities which require urgent attention in order to improve global healthcare. Surgery was highlighted poorly. [6] Currently, in sub-Saharan Africa, patients who would receive routine surgical treatment in first world countries never reach health facilities and the small proportion who do are met with inadequate human or physical resources. [4]

The recent Copenhagen Consensus also ranked essential surgery as one of the highest priority investments to improve the health of the world's poor. Despite these calls to action, there has been very limited discussion about the key aspects of health policy development to improve access to surgical services in low-income settings. [3] Historically, the global health community did not focus its efforts on surgical care because it was perceived as being excessively expensive, and a fear that if surgical programs were supported, they would divert resources from more cost-effective population-based programs. [6]

For this reason, organizations preferentially funded programs targeting infectious diseases, despite "increasing evidence that charts the vast global burden of surgical conditions and the fact that relatively simple, cost-effective and curative surgical procedures can avert disability and premature death from many life-threatening emergencies and other conditions." [6]

Surgery is at the end of the spectrum of the classic curative medical model and has not been routinely considered as part of the traditional public health model. [7] However, no matter how successful prevention strategies are, surgical conditions will always account for a significant portion of a population's disease burden, particularly in developing countries where conservative treatment is not readily available, where the incidence of trauma and obstetric complications is high, and where there is a huge backlog of untreated surgical diseases.

The development of human resources for surgical services and perioperative care has been neglected and innovative strategies are needed to address clinician migration and capacity strengthening. Although a significant part of the global burden of disease can be treated with surgery, the majority of health facilities in low-income countries do not have the capacity to deliver even the most basic surgical services.

It is especially important that surgical services be made more widely accessible because future projections suggest a rapid rise in injuries and non-communicable diseases, many of which can be treated by surgery. [1] Moreover, it is important to treat surgical conditions because they tend to preferentially negatively affect the young working population and impoverished patients, through lost days of work and out-of-pocket health expenses. [4]

Global burden of surgical disease

The full extent of the global burden of surgical disease is largely unknown. However, the scope of the problem (the unmet surgical need), based on WHO data and other estimates, is thought to be large. There have been efforts to improve data collection in order to obtain accurate surgical epidemiology and estimates on burden of surgical disease. Despite the substantial burden of surgical disease, surgical services are not accessible to many of those who need them most. An estimated two billion people lack access to the most basic surgical care. [8] The Lancet Commission estimates this figure to be as high as five billion people. [9] The global volume of surgery has been estimated at 234 million operations annually, with a not surprisingly unequal distribution. Only 26% of these operations occur in developing countries, which contain 70% of the world's population. [8]

Several attempts have been made to measure the global burden of surgical disease. [9] In the first, and most widely cited study, 18 surgeons from various parts of the world estimated the proportion of surgical disease which would require surgery, based on their personal experiences. They concluded that 11% of the global burden of disease could be treated with surgery. [1, 4, 7] Table 2 demonstrates the estimated burden of surgical diseases.

Table 2: Estimated burden of surgical disease.

Conditions	Disability Adjusted Life Years (DALYs)	%
Total Surgical	164	100
Injuries	63	38
Malignancies	31	19
Congenital Anomalies	14	9
Obstetric complications	10	6
Cataract/glaucoma	8	5
Perinatal	7	4
Other	31	19

Total World DALYs 1648 million Estimated Surgical DALYs 164 million Surgical DALYs 11%

The disability adjusted life year (DALY) is one of the metrics used to determine the impact of the global burden of disease. The most DALYs are in South-East Asia with 48 million, though Africa has the highest ratio of DALYs per 1 000 people. While the DALY is useful as an initial estimate, a more formal evaluation is required. Future projections suggest that there will be a significant increase in non-communicable diseases. Already 80% of the deaths from conditions which are partially treatable with surgery occur in LMICs. [1]

Debas et al noted that it was extremely difficult to determine the burden of surgical conditions as measured in DALYs. [7] They listed all the conditions for which surgery might be indicated into three groups, with group I being communicable diseases, group II being non-communicable diseases, and group III being injuries. Faced with a near total lack of pertinent data, they tried to obtain consensus on a "best educated guess" for the surgical burden of each condition. A survey instrument, which listed all the possible surgical conditions (all potential surgical DALYs representing the maximum imaginable DALYs which could conceivably be surgical), was sent to 32 surgeons (18 responded) from various parts of the world. The surgeons were asked to give their opinion as to what proportion of each condition would require surgery. They referred to these 'guesses' as estimated surgical DALYs, or the conservative minimum.

It was estimated that 11 percent of the world's DALYs were from conditions which were very likely to require surgery. Their estimated figures were as high as 15 percent for Europe, and as low as seven percent for Africa. Estimated surgical DALYs for the world are 27 per 1 000 population. The estimated DALYs were nearly twice as much for Africa (38 per 1 000) as for the Americas (21 per 1 000). [7]

The second study attempting to measure the global burden of disease, investigated the impact of scaling up a basic surgical package, which could be provided at level one or district hospitals in LMICs. After assuming a counterfactual scenario in which mortality and morbidity were equal to the best performing regions on the basis of the Institute for Health Metrics and Evaluation (IHME) estimates, the researchers estimated that 1.4 million deaths could be prevented annually. [10] The avertable and non-avertable mortality and morbidity from this small number of surgical conditions within the three specific categories examined accounted for 14.2% of the total burden of disease in LMICs. [10]

The third study looking at the global burden of surgical disease was done as part of the Lancet Commission on Global Surgery. Surgeons, anaesthetists, and public health practitioners from around the world were surveyed, for each of the 21 IHME cause groups, and were asked to comment on the proportion of patients who, in an ideal world, would require a surgeon for management. Depending on the method of estimation and definition of burden used (death versus DALYs), they estimated that surgical conditions accounted for 28–32% of the overall global burden of disease. [9] This estimate was nearly three times higher than the first estimate of 11%, indicating that a substantial number of people were affected by surgical diseases.

Bickler et al proposed using cumulative disability-adjusted life-year (DALY) curves generated from age-specific population-based data to measure the burden of surgical conditions and the unmet need for surgical care. [2] This conceptual framework was based on the premise that surgically associated disability and death was determined by the incidence of surgical conditions and the quantity and quality of surgical care. The *burden of surgical conditions* was defined as the total disability and premature deaths which would occur in a population should there be no surgical care, and the *unmet need* for surgical care was defined as the potentially treatable disability and premature deaths due to surgical conditions. Burden of surgical conditions should be expressed as DALYs, and unmet need as potential DALYs avertable. [2]

They mentioned that the DALY continues to evolve in response to criticism and that this summary measure does not take into account contextual variables. Whereas the impairment associated with a particular disease process may be the same throughout the world, the disability associated with each condition will be determined by social and cultural variables in each environment. In addition, disability weights have not yet been calculated for many of the surgical diseases. [2]

A major disparity exists between high and low-income countries, and an estimate of regionally-specific DALYs which can be averted by surgical interventions is also needed. Studies from Uganda and Ghana demonstrated that inguinal hernias were a common condition, with less than a third of those in need of surgery being operated on. They showed a surgical correction rate of less than 1%. [11, 12]

Bickler et al have noted the problems related to measuring effective coverage for surgery need, utilization, and quality. [13] Data from health facilities are limited by their accuracy and completeness, and large-scale population-based data are valuable but expensive to obtain. Nonetheless, they maintained that a more thorough review of existing local data in selected sites was a critical and feasible first step as part of a broader research agenda in global surgery.

There is a tremendous unmet need for surgical services in developing countries, with substantially less of country's health expenditure being allocated to these services compared with first world countries. There are major gaps in knowledge related to surgery in LMICs. The overwhelming consensus points to a critical lack of data concerning the true portion of the global burden of diseases which could be alleviated by surgical expertise. [2] The burden and epidemiology of surgical conditions, economic evaluation of surgical services, and best practices for human resources to improve surgical and perioperative care need to be studied carefully.

Defining the need for surgical services in the developing world is the first step toward addressing the problem. It is crucial for infrastructure planning, training and funding from international donors, to be able to reliably estimate the scope of surgical disease in the developing world. [14] Firstly, basic definitions related to surgical conditions have not been clarified. Secondly, surgery is a procedure-oriented specialty; and previous global burden of diseases estimates have not been approached from an intervention perspective. Thirdly, the large number of surgical diagnoses, treatments and wide range in patient ages complicate the analysis. [2]

Although there is international consensus in the diagnosis and management of most surgical diseases (i.e. appendicitis), there tends to be a wide variation in the acceptance of a standard provision of treatment (i.e. appendectomy) and follow-up. In addition, there have been disagreements as to how to bring about system change. There is unfortunately limited information on surgical provision in LMIC in the world's literature. [15] Estimation of this surgical burden would be futile without the investigation into existing surgical infrastructure and resources already in place. This should be a starting point in countries where limited data exists.

Global paucity of data around surgical burden and resources

Contributing to this global crisis is the significant lack of comprehensive data to begin the process of health systems strengthening. [6] The limited health care infrastructure in many low and middle income countries is a challenge, not only for surgical delivery, but also for the collection and evaluation of data pertinent to understanding the unmet surgical need and surgical outcomes. The limited information on the provision of surgical care in developing countries was as a result of large population based studies and shared electronic databases not being in place. Understanding the limited healthcare infrastructure in LMICs may provide insight into patients being unable to access surgical care.

An example would be assessing 2-hour access to a first-level facility as proposed by the Lancet Commission on Global Surgery (LCoGS). Before 2-hour access can be determined, the location and number of facilities need to be mapped. By calculating the proportion of patients with surgically treatable diseases who are beyond the 2-hour access barrier, there would be a greater understanding of the unmet surgical need. However, Bickler et al commented that the most accurate way to assess the true unmet need would be through large-scale household surveys. [2]

International organizations (IO), non-governmental organizations (NGO) and private volunteer organizations (PVO) provide surgical services in many low and middle income countries and have a unique ability to collect data, report on infrastructure and advocate for surgical needs. However, many of these organizations are overwhelmed with delivery of care and response to humanitarian crises, disasters and other emergencies related to conflict and war. Therefore the data from these settings is often partially or poorly collected, rarely evaluated and infrequently shared between organizations. [15]

Little is known about the burden of surgical disease in rural sub-Saharan Africa, where district and rural hospitals are the main providers of care. Grimes et al performed a literature review of surveys conducted in rural areas, which reported on surgical admissions and operations performed. [16] Data were extrapolated to calculate the amount of surgical disease per 100 000 population and the numbers of surgeries performed per 100 000 population. These extrapolations were used to calculate the total, met and unmet need of surgical disease. They concluded that district hospitals were not meeting the surgical needs of the populations which they served. There was no measure of the quality of care being delivered at district level hospitals, nor the effect of surgical procedures on patient quality of life in such settings, and further research was needed in these areas. This was one of several studies conducted in LMIC which concluded that there was a lack of data on surgical burden and outcomes.

Taira et al conducted a systematic review of the English language literature to assess the burden of surgical disease in developing countries across the world. [17] The primary goal was to collect and summarize what had been published on the current global burden of disease and thereby encourage and promote the allocation of further research and resources. They summarized what little was known globally about the burden of surgical care across the developing world. The study provided a breakdown of the number of surgeries, the types of operations and whether surgeries were minor and major, across multiple district hospitals. Overall, the study showed a very high burden of trauma and injuries in rural areas, a large number of patients with injuries and bowel obstruction being admitted to hospital, but few fracture fixations or laparotomies being performed.

They noted that there was no measure of quality, neither of the surgeries being performed at district hospitals, nor of the effect of surgical procedures on patient quality of life in such a setting, and also recommended that further research was needed. There were very few studies looking at surgical infrastructure and resources, particularly in lower and middle income countries. These will be examined more closely in coming discussions.

Global surgery

'Global health is one of the defining issues of the 21st Century, attracting unprecedented levels of interest and propelling health and disease from a biomedical process to a social, economic and political concern.' [18] Surgery is gaining recognition as a legitimate component of global health. Jim Kim, President of the World Bank, urged the global health community to challenge the injustice of global inequity in surgical care, stating that surgery was an 'indivisible, indispensable part of health care and progress towards universal health coverage.' Increased awareness of the place for surgery within global health will benefit not only the surgical community, but all those working to improve health outcomes.

A proposed definition of *global surgery* [18, 19] is 'an area of study, research, practice, and advocacy which seeks to improve health outcomes and achieve health equity for all people who require surgical care, with a special emphasis on underserved populations and populations in crisis.' McQueen et al have reiterated that essential surgical services were not a luxury, but a critical component to achieve the 'highest attainable standard of health'. [6] *Essential surgical conditions* can be defined as those which are primarily or extensively treated by surgical procedures, which have a large health burden, which can be successfully treated by a surgical procedure or other surgical care, and which is cost-effective and feasible to promote globally. [20, 21, 22]

A practical approach suggested by Mock et al [20] was to rank surgical interventions as priority 1, 2 or 3 based on the burden of the specific disease, the success of the surgical intervention and the significant impact of the disability. (Table 3).

Table 3: Preliminary definitions for the levels of priority of surgical conditions.

Priority level	Definition
1	• Have a large public health burden • Surgical procedure is highly successful • Surgical procedure is cost-effective and feasible to promote globally • Laparotomy, external fixation of fracture, caesarean section, hernia repair etc.
2	• Have a moderate public health burden • Surgical procedure is moderately successful • Surgical procedure is moderately cost-effective • Repair of major vascular injuries primarily or vein graft, vesicovaginal fistula repair, cleft palate etc.
3	• Have a low public health burden • Surgical procedure is neither highly nor moderately successful in treating condition • Surgical procedure is low in cost-effectiveness

With limited resources and competing priorities, health planners can choose between interventions, they can decide if surgery is to become a public health priority, and they can select surgical conditions which have been shown to have a significant impact on population health. [23] *Essential Surgery* reflects an increased emphasis on health systems relative to previous editions of Disease Control Priorities (DCP) project. The Global Burden of Disease Project is an on-going assessment of disease control priorities which focuses on estimating the global burden of specific diseases and provides analyses of the cost-effectiveness of interventions. [17] The first comprehensive volume on the global distribution of diseases was published in 1990 without specific discussion on surgically-treatable disease. [7]

With the realization that many surgically treatable diseases contributed significantly to the burden of disease in developing countries, the second edition of the Disease Control Priorities project (DCP2) included a chapter on surgery. [24] Inspired by this work by economist Dean Jamison, a Global Burden of Disease Working Group (GBDWG) and the Lancet Commission on Global Surgery were launched in 2008 and 2014 respectively. The GBDWG advocated for a better understanding of the global burden of surgical disease and for improved surgical capacity in poor countries, including conflict and post-conflict settings. [17] Similarly, the Lancet Commission has been instrumental in promoting surgery in global health.

The DCP2 figures were based on the estimates as determined by Debas et al. These were the first estimates of DALY worldwide, and as we now know, these greatly underestimated the magnitude of the problem. They called for work to be done to obtain more valid, accurate and reliable data.

In December 2005, the WHO established the Global Initiative for Emergency and Essential Surgical Care (GIEESC), a partnership of IOs and individual professionals, which aimed to improve access to emergency and essential surgical procedures. [15] Recommendations made by the GBDWG meeting during the 2009 Harvard Humanitarian Initiative Action Summit included integrating the routine collection of data about surgical conditions, outcomes and resources.

Research suggested that many international organizations were actively collecting data which may be relevant for understanding surgical delivery and the unmet surgical need in LMIC. However, these data were not readily available to the countries in which they were collected as many organizations had not disseminated or published their results. Data collection needed to be streamlined and data sharing among organizations needed to be promoted. [15] Trying to obtain better data was critical to gaining more support and funding for these services. Further strategies with regard to data collection were expounded by the Lancet Commission.

The WHO Global Initiative for Essential and Emergency Surgery (GIEESC) Situational Analysis tool for evaluating a facility's surgical services _ (Appendix A), identified strengths and weaknesses as well as gaps in infrastructure, human resources, surgical innovations and equipment, and is used in around 138 countries. [25] They proposed six surgical metrics designed specifically to capture facility-level data on structural capacity (number of operating rooms, number of accredited surgeons, number of accredited anaesthesia professionals), process issues (volume of surgery) and outcomes (post-operative death ratios) [9].

The tool was simple and provided a snapshot of the capacity of hospitals to provide surgical care. Osen et al assessed the validity of the questionnaire in ten hospitals in Ghana and found that the hospital capacity survey questions related to infrastructure characteristics had high reliability. [19, 26] However, questions related to process of care had poor reliability and may have benefited from supplemental data gathered by direct observation. The Lancet Commissioners have adopted some of the WHO GIEESC tool, and have adapted it which resulted in the development of the six Lancet Indicators. [9]

The DCP3 placed an even greater emphasis on surgery by dedicating an entire volume (out of a total of nine volumes) to the topic. [27]

[The key findings were:

1) Provision of essential surgical procedures would avert an estimated 1.5 million deaths a year, or 6 percent to 7 percent of all avertable deaths in low- and middle-income countries.
2) Essential surgical procedures rank among the most cost-effective of all health intervention.
3) Measures to expand access to surgery, such as task-sharing, have been shown to be safe and effective while countries make long-term investments in building surgical and anaesthesia workforce.
4) Substantial disparities remain in the safety of surgical care, driven by high perioperative mortality rates and anaesthesia-related deaths in LMICs.
5) The large burden of surgical conditions, the cost-effectiveness of essential surgery, and the strong public demand for surgical services suggest that universal coverage of essential surgery (UCES) should be financed early on the path to universal health coverage.] [27]

Beyond disease burden, not much is known about the global provision of surgical care for diseases which might be treated, cured, or palliated by surgical intervention. Obtaining more accurate estimates of the avertable burden from surgically treatable conditions would require broad agreement on a definition of the concept of avertable burden, and the methods for its measurement. Better estimates of the avertable burden would also require more systematic data gathering from hospitals and population-based surveys on the significant proportion of the world's population who lack access to surgical care. [27]

In addition to individual research studies, the international community could contribute to developing and promoting metrics for ongoing monitoring of the burden of essential surgical conditions, as is currently being done for maternal mortality. While some countries do routinely collect data from (especially rural) hospitals, this is often limited to an operative logbook which records procedures and immediate perioperative mortality.

There has been no systematic review of even basic retrospective data to quantify the amount of surgery being done, and there is even less is known about the basic short-term outcomes of operations and the quality of perioperative care. [1] Health-facility-based data have limited generalizability, since most patients with surgical conditions never reach a health facility. As a result, community surveys are more appropriate to assess unmet surgical need.

With regards to surgical infrastructure and resources, most developed countries are reliant on integrative electronic networks which allow data sharing and cross-referencing. Most studies conducted in LMIC extrapolate data to calculate the numbers operating theatres and health care workers, as large-scale data collection efforts are labour intensive and expensive.

The Lancet Commission on Global Surgery

The LCoGS involved the collaboration between clinicians, scientists, educators and policy-makers and led to several important recommendations. Key objectives included promoting surgery within the global health agenda and identification of barriers and how to overcome them. [9]

The delivery of surgical care plays a fundamental part in prevention, diagnosis, treatment, and palliation of a broad range of medical disorders. It is a crucial component of a properly functioning health-care system and a prerequisite for universal health coverage. The untreated surgical disease burden translates into great economic strain on local and regional economies.

Despite the cost-effectiveness of providing surgical interventions in resource-constrained environments, there is an absence of political priority, and a paucity of policy support and solutions for the development of functional surgical systems in LMICs. [28] The authours of the Lancet Commission acknowledged that surgical care delivery was a core component of health systems, and aimed to embed surgical care within present global health initiatives and the post-2015 global health agenda.

The three co-chairs leading the process (JG Meara, AJM Leather and L Hagander) examined the present state of surgery within the global health agenda and characterised the role, nature, and range of surgery within health systems. This initial investigation has added to the slowly growing body of global surgery literature. The Lancet Commission on Global Surgery has developed consensus recommendations for all stakeholders involved in the funding, provision and governance of surgical care.

The gains made in global surgery in the past 25 years have been overshadowed by the fact that the development of safe, essential and life-saving surgical and anaesthesia care in LMICs may have stagnated or regressed. Many LMICs face a multifaceted burden of infectious disease, maternal disease, neonatal disease, non-communicable diseases, and injuries. [9] Surgical and anaesthetic care are essential for the treatment of many of these conditions and represent an integral component of surgical services in these regions, especially considering that the need for surgical services will continue to rise substantially from now until 2030. [29]

The Lancet Commission addressed several important issues, such as the gaps in the human resources, the economic effect of surgical conditions, the state of surgical care and the potential strategies for up-scaling surgical services in LMICs. The Commission brought together an international, multidisciplinary team of 25 commissioners, supported by advisors and collaborators from more than 110 countries and six continents. [9]

[Five key messages resulted from their efforts:

1) Five billion people did not have access to safe, affordable surgical and anaesthetic care when needed. Access was worst in low-income and lower-middle income countries, where nine out of ten people could not access basic surgical care. The previous estimate of two billion people was most likely an underestimate as the calculation was one dimensional using only operating theatre density.

2) One-hundred-and-forty-three million additional surgical procedures were needed in LMICs each year to save lives and prevent disability. Low operative volumes were associated with high case-fatality rates from common, treatable surgical conditions. The unmet need was greatest in eastern, western, and central sub-Saharan Africa, and south Asia.
3) Thirty-three million individuals faced catastrophic health expenditure due to payment for surgery and anaesthetic care each year.
4) Investing in surgical services in LMICs was affordable, saved lives, and promoted economic growth. If LMICs were to scale-up surgical services at rates achieved by the present best-performing LMICs, two-thirds of the world's countries would be able to reach a minimum operative volume of 5 000 surgical procedures per 100 000 population by 2030.
5) Surgery is an ''indivisible, indispensable part of health care'', as stated by World Bank President, Jim Kim. Surgical and anaesthetic care should be an integral component of a National Health System in countries at all levels of development.] [9]

Surgery requires careful impact assessment. Health metrics measure the effectiveness of interventions and the health system in general. These metrics are gaining importance as a means of evaluating the broader impact of public health programs, especially given the health reforms being implemented by many countries. [30]

Because traditional public health indicators, such as maternal mortality and under-five mortality, may not capture the full impact of surgical care on population health, specific surgical indicators need to be developed. Monitoring and evaluation has several important benefits, including the ability to assess whether the program is having its desired effect. This information allows surgeons and administrators to identify and improve upon weaknesses in the healthcare delivery system, resulting in better patient care.

This assessment also provides data about effectiveness to stakeholders. With proper reporting, funders may be confident in the return of their investment, governments can place their trust in the organization, and patients can be assured that their doctors are delivering quality care.

According to the World Bank, the WHO and UNICEF, surgical indicators are lacking. The Lancet Commission recommend that their six core surgical indicators [9] _ (Appendix B) should be tracked and reported by all countries. Global health organisations, such as the World Bank recommend the World Development Indicators, while the WHO recommend the Global Reference List of 100 Core Health Indicators. Other entities suggest tracking the 2015 Sustainable Development Goals (SDGs). One of the Lancet indicators includes assessing specialist workforce density with a recommendation to have at least 20 surgical, anaesthetic and obstetric (SAO) providers per 100 000 people in 100% of countries by 2030. Other indicators include access to timely surgery, assessing surgical volume, perioperative mortality and protection against impoverishing health expenditure.

Given the large number of diagnoses and procedures in ICD-10, it is unrealistic to try gather information (or estimate the burden) on the full spectrum of surgical conditions and/or interventions. A more practical approach might be to focus on a subset of these conditions or procedures. Procedures such as caesarean section, abscess drainage, laparotomy, and fracture care are likely to account for a significant percentage of interventions in most settings. [2] The Lancet Commission has proposed the use of three *Bellwether procedures* which are markers of system functioning. The performance of these procedures suggest a level of complexity advanced enough to do most other surgical procedures. [9] They propose that the provision of surgical services should be competency-based and related to health system strengthening and not just a list of procedures.

A template for a National Surgical plan _ (Appendix C) has been proposed by the Lancet Commission, and involves infrastructure (tracking number of facilities), workforce (density and distribution of surgical, anaesthetic and obstetric specialists), service delivery (Bellwether procedures), financing, and information management (robust information systems). Of particular relevance to this research, were the first two.

By tracking the number and distribution of surgical facilities as well as mapping surgical providers, these crucial data can be directed towards the development of a National Surgical Plan aimed at dealing with the global burden of surgical disease. Data collection, analysis, and reporting of a limited set of indicators, can focus attention and rouse support for surgery.

Most of what is known about the burden of surgical conditions is based on mathematical modelling methods or limited data samples, and the use of invalidated instruments calls into question the accuracy of results generated. This gap in reliable data hinders knowledge of disease burden and the ability to monitor change, track interventions, or build robust advocacy and funding platforms. Additionally, inappropriate allocation of resources and policy decisions could occur if inaccurate results from invalidated methods are used to inform health service decisions. Lastly, concerns around data collection involve issues related to funding, feasibility and sustainability, as well as data use, ownership and database maintenance. [9]

Cost-effectiveness of treating surgical diseases

The cost of surgical expansion 2015-2030 will cost around US$350 billion, or one thirtieth of 1% of world's GDP. [9] The burden of surgical disease, although not well quantified, is immense. Up until a few years ago, there had been no attempt to measure the global burden of surgical conditions and no analysis had been done to determine the cost-effectiveness of interventions for the surgical burden. [17]

The DCP initially estimated that the costs per DALY averted through surgical services in district hospitals were considerably lower than those in community clinics, and fell into three categories [7]:

1) Surgical services in district hospitals in sub-Saharan Africa and south Asia were the most cost-effective, with the best estimates per DALY averted ranging between US$33 and US$38. Cost-effectiveness was greatest in these regions because the cost of infrastructure and personnel was low and because the disease burden was high. Most surgery in district-level hospitals was emergency surgery. Therefore, health systems need to disperse surgical facilities widely in the population, and surgical teams working in level one hospitals should have a broad array of basic emergency skills rather than a narrow range of specialized skills.
2) Services in the Middle East and North Africa, and Latin America and the Caribbean were the most costly (but still within an affordable range), with the cost per DALY averted between US$79 and US$94.
3) Services in East Asia and the Pacific fell in the middle, with cost per DALY averted at about US$55. These findings show that providing 'surgical care in a district hospital in sub-Saharan Africa and south Asia was an exceptionally good buy' [25] - both were regions with high disease burdens. Coupled with evidence that district hospitals tend to be relatively underfunded, a strong case exists for increasing support for these services.

Chao et al conducted a systematic review of articles looking at cost-effectiveness of surgical interventions, published between 1996 and 2013, and 26 out of 584 studies met full inclusion criteria. They once again found that many surgical interventions are very cost-effective in resource poor settings. [30] If left unaddressed, surgical disorders were likely to comprise more than two-thirds of the global years of life lost in 2025.

Thus, it is a misconception that surgical interventions are overly expensive. In reality they can be very cost-effective in comparison with antiretroviral therapy for HIV infection which is estimated to be US$350 - US$1 494 per DALY averted, and vaccinations (US$5 per DALY averted). Existing data suggests that many surgical interventions would decrease burden at low cost and therefore surgery can no longer be viewed as too costly or complex to be included in essential care in LMICs. [4, 7, 18, 23]

Surgical Infrastructure

Understanding a country's baseline surgical and anaesthetic capacity with appropriate metrics is critical to improving the quality of services and outcomes. The Lancet Commission has attempted to compile estimates from around the world and make recommendations for a minimally acceptable standard of care.

Surgical care in all settings is hazardous - these include risks from the diseases themselves, the operation, and the anaesthesia. These hazards translate into dramatically different risks of death and other complications in different settings. For example, compared with Sweden's rate of 0.04 deaths per 1 000 caesarean sections, the mortality is at least two to four times higher in Latin America and the Caribbean, six to ten times higher in south Asia, and 100 times higher in sub-Saharan Africa. [27] Other studies in industrialized countries have shown a perioperative rate of death from inpatient surgery from 0.4 to 0.8%, and a rate of major complications of three to 17%. These rates were likely to be higher in developing countries due to lack of staff and monitoring. Some studies from developing countries, found a death rate of 5-10% for major surgery, and that approximately seven million patients undergoing surgery each year had major complications, including one million patients who die during or immediately after surgery every year. [32]

Another consequence of lack of surgical infrastructure was that fewer surgeries were performed, resulting in delays to treatment and often more resource intensive surgery for pathologies such as advanced malignancies. [1] A shortage of surgeons results in an unacceptable pressure on remaining surgeons without the opportunity for second opinions and support. This leads to poor standards in surgical care with an 'anything is better than nothing' approach. [19] As mentioned, the data surrounding surgical burden is scarce, but so too is the data estimating global operating theatre and surgeon distribution.

Surgical Workforce

Human resources are the backbone of health-care delivery systems. The lack of human resources in developing countries is often the greatest challenge to providing surgical care. Thus, simply funding and providing equipment will not completely address the surgical disparities which exist between low and high income countries.

Africa has less than 1% (the exact number is unknown) of the surgical work force in comparison to the United States, and a significantly greater share (nearly 25%) of the burden of disease. [4] Major shortages in the surgical workforce are compounded by maldistribution of the existing workforce resulting in gross inequity. LMICs are disproportionately affected by low surgical workforce density, and in particular, people living in rural areas, those with a low income, and those who are marginalised are the most affected by these shortages. [9]

The maldistribution of the specialist surgical workforce, measured by the density of specialist surgeons, anaesthetists, and obstetricians per 100 000 population, correlates with specific health outcomes. [9] It has been noted that countries with increased densities of surgical providers per 100 000 population have improved maternal survival. For each ten unit increase in the density of surgeons, anaesthetists, and obstetricians, maternal mortality decreases by 13.1%. [33]

The thresholds of 20 and 40 providers per 100 000 corresponds with a volume of surgery of between 2 917 and 5 834 procedures per 100 000 population, respectively, and are symmetrically distributed around the estimated global need of 4 664 surgical procedures per 100 000 population. [9] Forty four percent of the world's population live in countries with a specialist surgical workforce density lower than 20 per 100 000 population, and only 28% live in countries with a specialist surgical workforce density higher than 40 per 100 000 population. [33]

Using the higher workforce density of 40 per 100 000 population as an optimum, it was estimated that in 2015 there was a worldwide shortage of just over one million specialist surgical, anaesthetic, and obstetric providers in 136 LMICs. The global workforce would need to double in the next 15 years to meet this need.

A WHO report published in 2006 identified a threshold of 228 skilled health care professionals per 100 000 below which countries were unable to reach essential health targets and were deemed to be in health workforce crisis. Updates describe 83 countries still below this threshold. [34] However, the data collected did not address how specialty-specific providers were distributed within each country. This uncertainty has prevented accurate assessment of surgical workforce needs and has hampered workforce planning at both national and international levels. [9]

A collaboration between the WHO and the Lancet Commission was formed in order to collect information about national numbers of specialist surgeons, anaesthetists, and obstetricians worldwide. The estimates from this WHO Global Surgical Workforce database suggested a supply of 1 112 727 (IQR 1 059 158–1 177 912) specialist surgeons, 550 134 (529 008–572 916) specialist anaesthetists, and 483 357 (456 093–517 638) specialist obstetricians worldwide. [33]

The surgical workforce is a dynamic system affected by a balance of factors. In the developing world in particular, there are significant resource constraints and incentives to leave the specialty, the public sector, and the country. Factors which contribute to the entry and exit of the surgical workforce include an absence of student exposure to surgery and anaesthesia due to an absence of trainers and equipment. There are often greater opportunities for training, career advancement, as well as remuneration, in both the private sector and outside the country. [35, 36]

The most important barrier to the provision of safe pre-, intra- and post-operative surgical care is the shortage of trained staff. The DCP3 summarized other reasons for this scarcity and included: low numbers of medical school graduates, inadequate initial and ongoing training, poor salaries and working conditions, inability to motivate and retain staff in remote and rural areas, as well as staff attrition due to retirement, death or resignation. [37] The economic loss of a doctor emigrating from Africa to another continent is estimated at US$184 000, and the numbers leaving are huge. [9]

The remaining doctors tend to concentrate and work in urban areas and prefer working in regional and even national hospitals, which limits access for rural populations, which often comprises up to 75% of national populations. Another difficulty is having few remaining surgeons to train the next generation, resulting in a vicious cycle. [4] Specialists working in the public sector in these settings are often compelled to carry out dual practice in both public and private sectors. In South Africa, this is termed remunerated work outside public service (RWOPS). This might affect the quality of care delivered by these practitioners, as well as increase the risk of fatigue and burnout. [38]

It is estimated that an average of 12.0% (range 0.6–28.9%) of all specialist surgeons, anaesthetists, and obstetricians in high-income countries are foreign nationals who have graduated from medical schools in LMICs. [9] The total scale-up costs to achieve surgical workforce growth for 88 LMICs during 2012 - 2030 would be about US$420 billion. This number represents 1% of total annual health expenditures in upper-middle-income countries like South Africa, and approximately 8% and 6% for low-income and lower middle-income countries.[9]

Workforce innovations/task shifting and sharing

Task shifting implies the delegation of certain medical responsibilities to less specialized healthcare workers. However, some have suggested that *task-sharing* may be a more appropriate concept.

In surgery, these health-workers are capable of carrying out many of the diagnostic and clinical functions of medical doctors in emergency obstetric care, including major surgery. Mozambique and Tanzania have utilized these clinical officers, or non-physician clinicians, and found no difference in morbidity or mortality rates, making this a viable alternative in resource constraint settings with the right training available. [39] Task-shifting has been promoted as a cost-effective strategy to increase access to essential surgical care.

It has been used effectively in LMICs where non-physicians have been trained to treat specific surgical conditions. Evaluations in these countries showed that 85% of operations could be adequately performed by general doctors and/or paramedical staff with the appropriate surgical training and supervision. [39, 40]

The surgical workforce requires in-depth study to look at the mixes of workers needed and the level of training required for district level hospitals, as well as the role of non-specialist surgical providers. [7] These non-specialist surgeons contribute to the alleviation of the surgical burden of disease and need to be considered when assessing surgical workforce density.

Surgical Workforce numbers in Africa – what do we know?

In a recent systematic review of the number of surgeons, obstetricians and anaesthetists in LMICs, only 6 of 42 countries described relevant countrywide statistics [41]. To date, numbers of surgical providers or surgical infrastructure have not been recorded or published in national health sector reviews or official country reports, according to the World Health Organization. Data fields on basic and comprehensive surgical services, infrastructure and workforce have only recently been included in the WHO Service Availability and Readiness Assessment (SARA) questionnaire (WHO 2014a) and the Demographic and Health Surveys (DHS), and will take several years before information becomes available. [41]

A commonly quoted statistic stated that 'Africa has less than 3% of the healthcare workers, 1% of the surgical workforce and bears nearly 25% of the burden of surgical disease.' [6, 42] Funk et al estimated that across 23 LMICs, the ratio of general surgeons per population ranged from 0.13 to 1.57 per 100 000 [27, 43]; and the ratio of anaesthetists per population ranged from 0 to 4.9 per 100 000 [41]. In contrast, the United States (US) had nine general surgeons and 11.4 anaesthetists per 100 000 [44]. Other older studies show a ratio of one surgeon per 100 000 in sub-Saharan Africa and 5.7 general surgeons per 100 000 in the US. [45]

Table 4: Total number of general surgeons per 100 000 as reported by Mars et al. [42]

Country	Number of general surgeons	Number of general surgeons per 100 000 population	Percentage of doctors who are surgeons
South Africa	954	2.1	5.3
Kenya	230	0.7	9.1
Zambia	50	0.5	8.3
Uganda	63	0.4	3.0
Tanzania	105	0.3	13.6
Mozambique	35	0.2	8.5
Malawi	9	0.1	7.2

Based on reports from other literature, Table 4, these numbers grossly overestimated the number of practising surgeons in countries like South Africa, Zambia and Uganda and reinforced the need for more accurate assessments in these countries. The HPCSA database also overestimated and showed that 0.8% were deceased, 15% were retired and up to 4.5% were practising overseas despite maintaining registration with this body.

The WHO suggested that at least 20 doctors per 100 000 are required to provide minimum basic health services. [9] There are 121 medical schools in Africa, of which 87 are in sub-Saharan Africa. There are four countries in Africa which do not have medical schools. [42] South Africa has eight medical schools and a central College of Medicine which is responsible for certifying general surgeons and other specialists. Africa has a ratio of one medical school per 7.6 million people, compared with the norm in the developed world of one per 2 million people. South Africa produces around 50 general surgeons per year and there has over the last 5 years been an increase in the College exam pass rate from 60 to 80 percent. [46]

The College of Surgeons of East, Central and Southern Africa (COSECSA) conducted a survey in 2011 of surgical capacity and surgical education in the COSECSA countries: Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Uganda, Tanzania, Zambia and Zimbabwe. [47] Table 5. The aim was to delineate the current status of surgical capacity and training.

This was carried out with view to develop key guidelines and recommendations concerning surgical education at the COSECSA surgical training and Fellowship (FCS) and Membership (MCS) levels. They also determined the number of non-physician clinicians (NPCs) conducting essential surgery in these countries.

Table 5: Overview of surgical training in the COSCESA countries.

Country	Total number of surgeons trained	Surgeons per 100 000 population
Ethiopia	372	0.40
Kenya	242	0.54
Malawi	9	0.05
Mozambique	No programme	0.2
Rwanda	17	0.27
Tanzania	No programme	0.3
Uganda	13	0.4
Zambia	31	0.5
Zimbabwe	18	0.12

Of the 47 countries in sub-Saharan Africa, 38 do not meet the WHO recommended minimum of 20 doctors and 100 nurses per 100 000 population or the surgical specialities combination required to deal with the burden of surgical diseases. [47] The report suggested there was one surgeon for every 196 000 people, and in rural areas this declined to one for every 2.5 million people. There is little information from developing countries regarding the capacity of surgical service delivery in hospitals. It is even more difficult to quantify how much surgical research is being done in Africa. The lack of information on surgical services and capacity in developing countries propelled the WHO to work closely with the ministries of health, WHO local offices and academia to reduce morbidity and mortality related to surgical conditions as well as strengthen existing training programmes.

Lavy et al performed a literature search of the PubMed and African Healthline databases over a three year period and also concluded that the number of surgeons per 100 000 population in African countries was extremely low with less than one surgeon per 100 000. [48]

Uganda, like other low-income sub-Saharan African countries, bears a heavy burden of surgical conditions, with low surgical outputs in health facilities and significant unmet need for surgical care. [3] Medical officers (physicians) perform most of the surgery in the rural areas because surgical specialists are not posted in district hospitals. A recent study of medical officers showed that many are planning to leave their jobs due to poor working conditions, living arrangements, limited opportunities for career advancement, and limited family opportunities. [49]

The WHO situation analysis tool can rapidly assess gaps in manpower and infrastructure at the general hospital level and has been used in a number of countries in the sub-Saharan Africa. Although the Lancet Commission Indicators are another form of global surgery assessment, preliminary assessments of surgical output and functionality of facilities have already been performed in Uganda using some of the indicators in the WHO tool. [3] Luboga et al recommended that the burden and epidemiology of surgical conditions, economic evaluation of surgical services, and best practices for human resources need to be studied carefully. Context-specific gaps in knowledge related to surgical services must be identified. This could be facilitated by the creation of a database, as well as conducting research at the academic centres. [3]

Ozgediz et al conducted the first comprehensive analysis of the surgical workforce on Uganda, and found that the precise gap between the developed world and this LMIC was largely unknown. [38] They assessed surgical workforce as well as surgeries being performed over a one year period at nine district level hospitals. In Uganda, there are approximately 2 200 physicians, or between 4 and 8 per 100 000 people, with an annual output of 150 physicians. For a population of nearly 30 million people, there are approximately 75 specialist-trained general surgeons in Uganda.

A retrospective study conducted by Galukande et al collected data from eight district hospitals in Uganda, Tanzania and Mozambique using interviews with key informants. [50] They concluded that overall the scope of the procedures were narrow and there were low levels of surgical care provision at the district hospitals studied. There were low rates of major surgery at district hospitals, ranging from 50 to 450 surgical procedures per 100 000 population. The number of hospital beds per 1 000 population ranged from 0.2 to one.

As part of the International Collaboration for Essential Surgery (ICES), Henry et al, in partnership with the Malawi Ministry of Health, quantified the surgical capacity in government hospitals, through workforce, infrastructure and health service delivery components [51]. Over a three month period, they surveyed district and mission hospital administrators and clinical staff onsite using a modified version of the Personnel, Infrastructure, Procedures, Equipment and Supplies (PIPES) tool from Surgeons OverSeas, adapted from the WHO Situational Analysis Tool to assess Emergency and Essential Surgical Care. In order to improve accuracy, the hospitals were visited by one of the researchers.

The number of facilities demonstrating adequacy of the assessed components, surgical case rates, operating theatre density, and surgical workforce density were calculated. Twenty-seven government hospitals were surveyed (90% of the district hospitals and all central hospitals). Of the surgical workforce surveyed, 92.7% were non-surgeons and 77% were clinical officers. Of the 109 anaesthesia providers, 95.4% were non-physician anaesthetists. Non-surgeons and non-physician anaesthetists were the only providers of surgical services and anaesthetic services in 85% and 88.9% of hospitals, respectively. No specialists were available in the district hospitals.

The average general surgeon density is 1.21 per 100 000 people compared with the recommended 4.7 per 100 000 people in the US [52]. The average anaesthesia workforce density is even more dire with 0.22 per 100 000 people. All specialists were found in urban areas.

Surgical rate, operating theatre density and total surgical workforce density per 100 000 population were 289.48–747.38 procedures, 0.98 theatres and 5.41 surgeons (qualified and clinical officers) and 3.68 anaesthetists (qualified and clinical officers), respectively. The global average for operating theatre density was 6.2 per 100 000. [43] Non-physician surgical and anaesthetic clinical officers provided care at the majority of hospitals in Malawi demonstrating that task shifting or sharing was fundamental to bridging the surgical service delivery gap. Ongoing support and mentorship and incremental skills training by specialist physicians should be a priority in countries that have a surgical workforce shortage. [51]

Although no consensus currently exists, it has been suggested that metrics such as surgeon density (surgeons per 100 000 people), annual case rate (annual number of major operations per 100 hospital beds, the number per 1 000 inpatient admissions, the number per 10 000 new outpatient consultations, or the annual number per 100 000 catchment area population), number of operating theatres, and 30-day perioperative mortality rate could potentially be routine indicators of the quality of surgical care or the ability of the health system to provide adequate safe surgery. [8, 41, 53] Results from this study, along with defined benchmarks contribute to the WHO SARA survey as well as the DHS survey to provide countrywide information and thus aid the completion of a global database of surgical capacity.

The WHO Situational Analysis tool was used to assess the surgical capacity at 14 hospitals in Somalia. [54] The 14 facilities which were surveyed had 137 health care providers, of which 15 (11%) were fulltime trained specialists. Each facility reported having at least one operating theatre with a maximum of between 11 and 20 theatres. Once again, this data provided insight into surgical resources in LMICs.

Notrica et al conducted a survey to assess the surgical and anaesthesia infrastructure in Rwanda, as part of a larger study examining surgical and anaesthesia capacity in low income African countries. [55] The survey tool was administered at 21 district hospitals in Rwanda using convenience sampling. Rwanda had a total of 45 hospitals and undertook 43 000 surgical interventions during 2008.

The average district hospital had around 195 beds and 3 operating theatres. The results demonstrated that there were only nine Rwandan anaesthetists and 17 Rwandan surgeons providing surgical care for a population of more than 10 million. The specialty-trained Rwandan surgeons and anaesthetists were practicing almost exclusively at referral hospitals, leaving surgical care at district hospitals to the general practice physicians and nurses.

Although the WHO tracks the numbers of physicians and other health care providers per country as a public health indicator, they do not report the number of specialists in a country. Merchant et al performed a comparison of four countries (Guatemala, Guyana, Laos and Mozambique) across the world and showed similar basic progress as well as ongoing surgical and anaesthetic needs in these resource-challenged countries. They assessed the human resources, the essential infrastructure, the surgical outcomes, the operating theatre information and outcomes, the equipment, and international and government organization provision of surgical care. [56]

Forty-nine hospitals were surveyed and the results are shown in Table 6. They reported a bias as a result of convenience sampling, and highlighted the need for more information. There was a need for support from professionals and international organizations since this was a massive and very costly undertaking. The common assets and needs between LICs and LMICs could shape global health policy and further research is needed.

Table 6: Health indicators and surgical resources for four LMIC.

Country	Infant mortality rate-IMR (per 1 000 live births)	Maternal mortality rate-MMR (per 100 000 live births)	Caesarean section rate (%)	Number of hospitals surveyed	Average theatres per hospital	Mean number of surgeons at hospitals surveyed
Laos	54	220	2.0	12	1	2.0
Guyana	30	250	16.1	9	2.1	0.75
Guatemala	26	140	16.3	21	5	7.8
Mozambique	62	480	2.0	7	2	1.29

When looking at the available surgical resources in Africa and other LMICs, comparisons are invariably made with developed countries such as the United Kingdom (UK), Australia and the US. In 2010 the Association of Surgeons of Great Britain and Ireland (ASGBI) recommended a consultant workforce ratio of 1:25 000 population and an overall maintenance of consultant surgeon numbers. [57] The number of active surgeons in the US per 100 000 population in 2009 was 44.6. The number of general surgeons was 22 486, and other surgical sub-specialities were 6 440. [58]

The Australian workforce data from 2011 demonstrated that there were 4 089 active surgeons. Feminization had increased the diversity of the medical workforce over the past three decades with 23.8% of Australian surgeons being female and 54.3% of medical school students being female. [59] In comparison with the South Africa College of Surgeons, which had an 80% pass rate, [46] the Australian College had a 96.9% pass rate resulting in a larger number of surgical registrars or residents qualifying each year. Developed country's data were readily accessible and available for global comparison, unlike those of the developing world. Table 7 demonstrates the estimated number of surgeons per 100 000 according to country. [45, 47, 48, 51, 52, 53, 54, 55, 57, 58, 59]

Table 7: Estimated surgeons per 100 000 according to country.

Country	General surgeons	Population 2010/2011	Surgeons per 100 000 population
UK	19 116	62 735 000	30.5
Australia	4 089	22 342 398	18.3
United States	22 486	308 745 531	7.4
Northern Ireland	88	1 811 000	4.9
Wales	133	3 018 000	4.4
England	2 052	52 655 000	3.9
Scotland	200	5 251 000	3.8
RSA	894	50 270 497	1.8
Kenya	230	42 030 000	0.6
Zimbabwe	60	13 089 000	0.5
Zambia	97	13 630 000	0.7
Tanzania	105	40 200 000	0.3
Uganda	75	31 400 000	0.2
Sierra Leone	10	5 865 000	0.17
Malawi	25	15 460 000	0.16
Rwanda	17	10 746 311	0.16
Mozambique	35	24 580 000	0.14
Ethiopia	44	89 390 000	0.05

Operating theatres

Adequate facilities are crucial for the provision of basic surgical care. Even the best trained and motivated surgical team cannot function without appropriate infrastructure. [48] Little is known about the surgical shortages in south Asia and sub-Saharan Africa with respect to the availability of surgical facilities, staff and equipment levels. [42]

Funk et al estimated the global distribution of operating theatres by extrapolating data from 769 hospital profiles in 92 countries. They used linear regression models and estimates of WHO and World Bank to estimate economic, population and health data. [43] They found that the total number of theatres was not publicly reported by each country. In addition, the proportion of operating theatres without pulse oximetry in Africa was between 51 and 70%. This was in comparison with North America and Western Europe where less than 1% of operating theatres were without pulse oximetry. [43]

In addition to the lack of monitoring and basic supplies, there was a lack of physical space equipped for surgery. The estimated number of operating theatres in west sub-Saharan Africa was less than one per 100 000 compared with Eastern Europe , where there were 25 per 100 000 people. [43] All high income regions have at least 14 operating theatres per 100 000 people. In contrast, Table 8 clearly demonstrates the disparity in the availability of surgical resources worldwide. Low income regions comprised more than two billion people but had fewer than two operating theatres despite the high burden of surgically treated diseases per 100 000.

High income countries had ten times as many operating theatres per person, and up to a hundred times as many surgeons as did LMICs. [17] The analysis had important limitations. They used hospital profiles from the WHO safe surgery saves lives programme as the basis for their theatre estimates as total numbers were not reported by every country. There were inconsistent reports from countries with regard to hospital beds and it was impossible to postulate about optimum number of theatres for a particular sub-region.

Table 8: Estimated number of operating theatres per 100 000 population. [43]

Region	Countries	Population (millions)	Economic wealth	Estimated number of theatres	Estimated number of operating theatres capita (95%CI)
Europe (Eastern)	7	210,4	UMIC	52777 (43952-63373)	25·1 (20·9–30·1)
Asia-Pacific (high income)	4	180·8	High	43 958 (38 995–49 554)	24·3 (21·6–27·4)
Europe (central)	12	119·1	UMIC	18 747 (16 342–21 505)	15·7 (13·7–18·1)
Europe (western)	23	409·0	High	60 196 (53 478–67 757)	14·7 (13·1–16·6)
North America	2	335·4	High	48 037 (41 024–56 250)	14·3 (12·2–16·8)
Australasia	2	24,7	High	3532 (2095–5954)	14·3 (8·5–24·1)
Latin America (southern)	3	58,9	UMIC	8058 (5980–10 859)	13·7 (10·1–18·4)
Asia (central)	9	77,5	LMIC	9036 (7938–10 286)	11·7 (10·2–13·3)
Caribbean	16	37	LMIC	3870 (3129–4785)	10·4 (8·4–12·9)
Latin America (tropical)	2	195,3	UMIC	19 675 (14 306–27 058)	10·1 (7·3–13·9)
Asia (east)	2	1352·2	LMIC	63 339 (55 758–71 951)	4·7 (4·1–5·3)
Latin America (Andean)	3	50,1	LMIC	2263 (1662–3080)	4·5 (3·3–6·1)
Middle East, North Africa	18	413,6	UMIC	17 592 (15 702–19 708)	4·3 (3·8–4·8)
Latin America (central)	9	218,1	UMIC	8729 (7105–10 725)	4·0 (3·3–4·9)
Sub-Saharan Africa (southern)	6	68,5	UMIC	2104 (1566–2827)	3·1 (2·3–4·1)
Asia (southeast)	13	581,2	LMIC	15 122 (13 578–16 842)	2·6 (2·3–2·9)
Oceania	14	8,3	LMIC	162 (119–221)	1·9 (1·4–2·7)
Asia (south)	6	1523,1	Low	20 540 (17 944–23 512)	1·3 (1·2–1·5)
Sub-Saharan Africa (central)	6	87	Low	1008 (743–1368)	1·2 (0·9–1·6)
Sub-Saharan Africa (east)	14	314	Low	3472 (2930–4115)	1·1 (0·9–1·3)
Sub-Saharan Africa (west)	19	308,1	Low	3172 (2662–3780)	1·0 (0·9–1·2)
Total	190	6572,3		405 389 (385 405–426 408)	6·2 (5·9–6·5)

They recommended that the surgical workforce and infrastructure should be described and studied on a global level in order to quantify the disparity between resources in rich and poor countries. [43]

Surgical resources in South Africa

Health metrics for South Africa included a life expectancy of 59.1 and 63.1 years for males and females without HIV, respectively. [60] The IMR was 34.4 per 1000 live births, the MMR was 133.3 per 100 000 live births, and the caesarean section rate was 24.4% [61]. The WHO recommended a caesarean section rate of between 5 and 10%. The World Bank designation was that of an UMIC with a GDP of US$ 6 619 per head. [62] South Africa was classified as a LMIC for 61 years according to a report by Felip et al. [63] Total GDP for 2014 was US$ 350 billion with an estimated growth rate of 1.5% and a population total of around 54 million people. Provincial health metric data for South Africa are summarized in Table 9. [62]

Table 9: Summary of key indicators by province in South Africa (2013-2014). [64]

Province	Population (millions)	District Health Services expenditure per capita Rands 2013/14	Primary Health Care Expenditure per capita Rands 2013/14	Bed utilization rate	Average length of stay (days)	Early in-patient neonatal death rate (per 1000 live births)	Medical Aid Coverage (%)	Caesarean section rate (%)
EC	6.7	1 323	700	59.5	5.2	14.1	11.4	19.4
FS	2.7	1 119	690	65.1	3.9	12.3	18.0	25.5
GP	12.9	788	622	67.8	4.5	9.3	26.6	25.6
KZN	10.6	1 292	750	64.6	5.8	10.4	12.5	29.9
LP	5.6	1 431	617	64.2	4.5	33.1	8.7	16.5
MP	4.9	1 205	584	70.5	4.3	8.6	13.3	17.5
NC	1.1	1 302	856	64.8	3.2	12.8	15.4	18.9
NW	3.6	1 160	757	61.4	2.5	9.5	13.7	19.2
WC	6.1	1 045	632	88.7	3.7	4.8	25.5	28.6
RSA	54.7	1 137	673	68.3	4.7	10.1	16.0	24.4

The only South African study looking at health facility distribution, bed number and density was published in the *South African Medical Journal* in 1995. [65] Chetty performed an analysis of the distribution of health facilities in order to assist in the development of a comprehensive National Health Plan.

The study collected and verified data by using a number of different sources and cross-referencing the number and types of hospitals, hospital beds and fixed clinics. An assessment of population density in each of the then nine new provinces was performed and a comprehensive database for the years 1988 and 1993 was compiled. Integration analyses were made using population-to-facility ratios.

Notable disparities were found between provinces in the total (public and private) distribution of hospital beds per 1 000 population. They found shortfalls in the WHO recommendation of 10 000 people per clinic in most provinces.

The provision and distribution of health facilities is an important aspect of the development of a national health plan. Similar studies were conducted in 1984 and 1990, where hospital number and bed number were estimated, but there was insufficient information about the distribution of clinics. There were no integrative studies adequately looking at clinics and hospitals, nor comparing them to planning norms.

The primary data collection involved looking at the Hospital and Nursing Yearbook (HNYB) of South Africa. This book is a print on demand book and sourcing the most recent copy from 2011 is near impossible. Other sources used were statistical reports of the provinces, the Central Statistical Services, and the reports from the National Association of Private Hospitals. The data was verified by using the HNYB as the most comprehensive single source, and inconsistencies or deletions were compared with other versions of the book.

Furthermore, a random selection of hospitals was made and the information confirmed by telephonic communication with hospital administrators. The HNYB information was difficult to interpret and verification was carried out by comparing the reports of the regional directors of the Department of National Health and Population Development (DNHPD) with the HNYB. Obvious discrepancies were found and finally the data was again confirmed telephonically. Multiple sources of data made it possible to detect omissions and additions. Exhaustive telephonic contacts with local authourities significantly improved this information. Revised data from all the identified sources were used and considered sufficiently comprehensive for analysis. [65]

Hospital ownership was categorized as public, private or military as well as according to level of care. Hospital beds were described slightly differently in that 'referral beds' were those found at tertiary or national central level hospitals (academic teaching beds plus other referral beds), while 'acute beds' applied to all referral and general beds excluding special beds (psychiatric, tuberculosis (TB) and nursing homes). One problem with using hospital beds per capita as an international comparison, is that countries may differ on the definition of hospital beds leading to inconsistencies.

Population figures were then obtained for the nine provinces from the Development Bank of Southern Africa (DBSA) and ratios of hospital beds per 1 000 population and for clinics per population were calculated. This was done in order to compare them with accepted ratios used internationally and in health service research. It was found that the number of beds in both the private and public sector did not accurately reflect the number of beds accessible to the general population. It was suggested that a more accurate analysis would be the total distribution of public sector hospital beds per population and acute beds (referral and general) per population.

There were notable differences between provinces in the total number of public sector beds per 1 000 population. However, when the special beds were removed from the analysis, a more even distribution of acute hospital beds per 1 000 population was seen between provinces. (Table 10).

It was concluded that this disproved the often expressed argument that Gauteng and the Western Cape had more hospital beds per population and that the disparities between provinces was large.

Table 10: Distribution of public sector hospital beds in the provinces, 1993. [65]

Province	Public beds per 1 000 population (referral, general, special beds)	Acute beds per 1 000 population (referral and general)
Eastern Cape (EC)	2.7	2.2
Eastern Transvaal (Mpumalanga, MP)	1.5	1.5
Free State (FS)	2.6	2.2
Gauteng (GP)	3.0	2.4
KwaZulu-Natal (KZN)	2.9	2.5
Northern Cape (NC)	2.7	2.2
Northern Transvaal (Limpopo, LP)	2.1	2.0
North West (NW)	2.5	2.1
Western Cape (WC)	3.9	2.3
	2.7	2.2

Comparison data between 1988 and 1993 showed an increase in the number of private beds, which had almost doubled. Privatization had increased dramatically and there was a decrease in public sector beds and a slight increase in academic beds. It was suggested that an appropriate ratio of referral beds to general beds should be 0.08 and may provide an indicator of the appropriate balance between the facilities.

This research helped define the landscape for the health facility distribution in South Africa 20 years ago. Since then much has changed and no similar analysis has been published. It is evident regarding the importance of surgical data and surgical system indicators, such as those outlined by the WHO situational analysis tool and Lancet indicators, that more recent and accurate data is needed in order to contribute to a national database as well as towards a global database of surgical capacity.

Few South African studies have looked at the burden of surgical disease, partly due to the lack of electronic databases and limited sharing of existing data, as well as the time and expense it takes to collect these data. Hardcastle et al looked at the trauma disease burden in light of the facilities available to care for trauma patients in KZN. [66] They reviewed the trauma caseloads from 36 of 47 hospitals and recommended extensive upgrading in resources to deal with the massive caseload. This was one of the few studies in South Africa that looks at the burden of surgical disease and made recommendations for an inclusive trauma system in light of the planned National Health Insurance for South Africa.

Similarly, another South African study recommended for using a system of metrics to address deficits in surgical care. Clarke et al [67] looked at appendectomy rates and outcomes as a measurement of surgical service delivery and found district level hospitals deficient in carrying out basic surgical services. They noted that the South African district surgical system had been allowed to deteriorate alarmingly.

Private hospitals

Private hospitals play a significant role in the South African Health system. [68] However, private hospitals are available to only a limited few as roughly 16% of South Africans have private health insurance. There has been substantial growth in the private sector since 1990 with the current estimation of over 31 000 beds. This growth has occurred despite government's wish to achieve equity between the public and private sectors.

The bulk of the private hospitals are concentrated in major metropolitan areas such as Gauteng, Kwa-Zulu Natal and Western Cape provinces. The monopoly is held by the Netcare group, Life group and Mediclinic in these areas with smaller Independent and Mining private hospitals predominating in the remaining provinces. The Hospital Association of South Africa (HASA), as well as the Council for Medical Schemes with its chapter on private hospitals provided the most accurate and recent data, which is in stark contrast with the incomplete and illusive data for the public sector. [69]

Private beds constitute 21% of total hospital beds in South Africa, with a ratio in favour of surgical beds. This is possibly explained by the higher overall cost of a surgical admission due to theatre time and consumables and greater revenue generation. At present, there are over 200 private hospitals with over 31 000 beds in South Africa. There are approximately 12 751 affiliated medical practitioners and specialists that support the private health industry over and above the 54 000 employed professionals in the industry. [68]

National Health Insurance

The WHO recommends universal health coverage as part of the strategy to deal with the growing disparities in healthcare, particularly in lower and middle income countries. A National Health Insurance (NHI) scheme has been proposed by the current South African government. Van der Berg et al have provided a comprehensive overview of the proposal and its feasibility. [69] The report commenced with a short overview of the current state of the healthcare sector in South Africa and the evidence of considerable and growing dissatisfaction with the South African healthcare system. Broad indicators of health performance were very poor by international standards and in many cases seemed to be deteriorating. Various comparative studies have classified the South African health system as underperforming, with it being ranked very low in terms of quality. It is against this background that the current NHI should be interpreted and understood.

The NHI proposal recommends comprehensive, universal health coverage to the entire population, irrespective of contribution. Individuals are free to consult the provider of their choice as the NHI Authority is intending to contract with all service providers (both public and private). In addition, service will be free at the point of delivery with no co-payments or out-of-pocket expenses required from users. While data on the medical scheme population are readily available and can be used in a costing exercise, the challenge lies in the dearth of data on public sector demand and utilisation. [69]

There is a clear preference across all income groups for the services of doctors and specialists. While many people can currently see a health worker when they need to, they are not always satisfied with the service they receive in the public sector and this has increased the demand for private healthcare. This is confirmed by data which show that 28% of the uninsured reported that they visited a health worker in the private sector. Altogether 54% of all visits to private doctors or specialists were by uninsured people and although only 16% of the total population is covered by medical aid, the private healthcare sector serves a considerable number of uninsured households and individuals. [69]

According to utilisation projections the number of doctor visits could more than double and it is anticipated that the number of visits to specialists could treble. This demand modelling shows that the expansion of coverage and the elimination of co-payments envisioned under the NHI would result in a dramatic shift away from low levels of care (district hospitals and clinics) which do not provide access to doctors and a subsequent sharp rise in the demand for doctors and specialists. A study conducted at a regional hospital in South Africa looked at various reasons why patients prefer to access higher level hospitals instead of clinics and found that access to special investigations, doctors and the perceived better level of treatment were common motivating factors. [70]

The only way to ascertain the number of doctors, specialists, nurses and hospital beds in the country, is through a combination of various data sources. Official data sources vastly overestimate the actual number of doctors and specialists active in the country. Many official sources assume that there are approximately 35 000 doctors in SA, but research done as part of this report on the NHI indicated that this figure was around 24 000 (roughly 15 000 GPs and 9 000 specialists). Nurses are estimated at around 144 000. [69]

Using the demand projections, it was estimated that 10 000 extra GPs will be required to meet the increased demand. The increase in specialists required was estimated to lie somewhere between 7 000 and 17 000. The upper limit of the number of doctors reported by the HPCSA, seemed to be 35 988 registered medical practitioners. However, this number includes doctors who were registered in SA, but practising abroad and it seemed to be a gross overestimation of the true number of doctors practising in the country. (Table 11).

Table 11: Estimate of number of active doctors. [69]

	Public (including private doctors doing sessional work)	Public (excluding part-time and sessional doctors	Private	Private (excluding public)	Total
GP	10 653	8 027	7 298	6 917	14 944
Specialists	-	4 026	5 685	5 177	9 203
Total					24 147

Wadee et al acknowledged that there was a paucity of data regarding the true public-private distribution of healthcare personnel [71]. If one recalculates these relative percentages based on the data presented above, then the picture looks very different. (Table 12).

Table 12: Public versus private sector data based on industry sources and PERSAL data.

	GP (%)	Specialist (%)	Nurses (%)	Hospital beds (%)
Public	53.7	43.7	72.3	76.6
Private	46.3	56.3	27.7	23.4

The data above (0.77 per 1 000 physicians) seemed to be in line with that reported by the WHO, i.e. approximately eight doctors per 10 000 of the population (HPCSA data) for a population of approximately 48 million). The HPSCA data reported on the total number of medical practitioners. If one assumes this to include both GPs and specialists, then from the data presented above (based on industry sources) there were 24 147 active doctors in South Africa. The mid-year population estimate for 2009 was 49 million people. This would translate into a number of 4.89 (approximately 5) doctors per 10 000 population, which is much worse than the figure of eight cited by the WHO and other sources.

This research showed that there was a lack of data regarding current human resources in the public health sector. This was due to registration numbers not reflecting the actual number of doctors and nurses working in the country. The report presented recent data for 2009, with the best estimates for both the private and public sectors. They calculated the human resource requirements needed for the NHI and found that there would have to be a substantial increase in the number of health-care workers to meet the increased demand. In particular, it was calculated that an extra 17 000 specialists were needed and conservative cost estimates for implementing the NHI were around R187 billion, but probably closer to R443 billion.

Conclusion

Based on the review of the literature it was clear that the burden of surgical disease is an important and growing public health priority. The paucity of data regarding basic surgical indicators could not be overemphasized. Surgical workforce and operating theatre number and distribution were currently based on data collected by the WHO and Lancet Commission, and were extrapolated from numerous sources with questionable accuracy. There was a clear deficit in what was currently known about these and other data such as bed and surgical bed number.

The single South African study which was published in 1995 had a similar methodology but was extremely outdated and only examined two of the variables being examined as part of this research.

Summary

Surgery has been previously neglected as a humanitarian initiative, despite the obvious effect of surgical illnesses on morbidity and mortality. Surgical conditions lead to premature death and disability resulting in a massive economic burden which if left unmanaged will cripple the global economy. Recently, greater attention has been given to surgical services, as there is growing evidence of cost-effectiveness of surgical interventions, a significant volume and burden of surgical disease as well as global disparities in surgical care. It is estimated that surgical conditions account for 28–32% of the overall global burden of disease. There are major gaps in knowledge related to surgery in LMICs. The overwhelming consensus points to a critical lack of data concerning the true portion of the global burden of diseases which could be alleviated by surgical expertise as well as surrounding the existing surgical infrastructure and workforce available to deal with this burden.

Chapter 3: Research Methods

The purpose of this research was to conduct a quantitative descriptive analysis of surgical resources in South Africa. No large-scale national audit looking at these particular variables has been published in the past twenty years and information is currently incomplete or non-existent.

3.1 Research Design

This study involved a descriptive analysis of surgical resources and included the total number of hospitals, of hospital beds, the number of surgical beds, the number of general surgeons (specialist and non-specialist), and the number of functional operating theatres in South Africa.

3.2 Inclusion/Exclusion criteria

All public (n=329) and private (n=217) hospitals in South Africa were included in the study. The public hospitals included all district, regional and tertiary hospitals in all nine provinces. Clinics and so-called specialized hospitals such as psychiatric, TB and rehabilitation facilities were excluded. Facilities which performed day theatre cases were included, unless there were strictly only obstetric or orthopaedic procedures being performed.

3.3 Instrumentation

A telephonic audit was carried out and supported with email confirmation of required data. The captured variables were entered into a Microsoft Excel (2013) spreadsheet.

3.4 Research Procedures and Pilot Testing

As this was an audit, no formal pilot research was conducted. The defined variables did not change throughout the data collection period. Permission to conduct research was obtained from the Department of Health in each province and from individual hospitals that requested it.

A list of all hospitals in South Africa was obtained from the Provincial Department of Health, and were cross-referenced with electronic worldwide databases of hospitals in South Africa (Medpages and individual hospital websites). This was then cross-referenced with the hospital list from the National Department of Health hospital via the Minister of Health. Dr Terence Carter was the contact person.

The number of beds in the public hospitals was obtained from Stats SA estimates from 2011, and was used as a comparative once actual data collection was completed. Only provincial total estimates, as well as beds per capita were available. Subsequently, at the time of completion of research and write-up of the thesis in 2016, a 2014 database became available and was used as a more recent comparative for hospital bed number for each province. The Health System Trust (HST) provided estimates of the total hospital number and the hospital bed number for each province in the 2006/2007 and the 2008/2009 publications, and were again used as a comparative. Unfortunately they did not list these data for individual hospitals.

3.4.1 Public hospitals

The public hospitals were grouped according to the nine provinces in South Africa. The nine provinces were further subdivided into 52 major district municipalities. Hospitals were categorized as being district level, regional level, tertiary level or national central facilities based on services provided by the hospital. The tertiary and central hospitals were grouped together in the final data analysis as central (level three) hospitals in order to simplify analysis.

All facilities which were registered as clinics or specialised hospitals were excluded; examples included TB hospitals, psychiatric hospitals, as well as step-down care and rehabilitation facilities. It was assumed that these facilities provided either minimal or no surgical services. Surgical centres that strictly performed orthopaedic or obstetric procedures were excluded, as the aim was to examine general surgical services.

Either the Chief Executive Officer (CEO), the superintendent or the matron (in the case of district level facility) at each of the hospitals were telephonically contacted in order to obtain the relevant data. The data was confirmed via email correspondence _ (Appendix D). If these staff members were unavailable or uncertain about certain data, then Head of the Department of Surgery or senior doctors were contacted. The latter was only necessary at a minimum number of facilities. Hospitals were contacted during the period 1st October 2014 until the 31st of December 2014.

3.4.2 Specialist surgeons

In order to determine the number of specialist surgeons, the Health Profession's Council of South Africa (HPCSA) was contacted and the national and provincial databases accessed. This was cross-referenced with the College of Medicine of South Africa (CMSA) database, as well as the National census data from the most recent National Population census in 2011. Professor Martin Veller, Head of the Department of Surgery at the University of Witwatersrand and Chairman of the Association of Surgeons of South Africa (ASSA), provided unpublished data from a study which investigated the number of general surgeons.

3.4.3 Private hospitals

Private hospital data were readily available from the Hospital Association of South Africa (HASA). Extensive data were provided on hospitals, the number of beds, the type of hospital beds, as well as the number of operating theatres. The number of specialists working at the private facilities was not provided. All private hospitals were contacted telephonically and the data confirmed. Specialist surgeon number was not requested as a single surgeon often works at several private facilities in a region, which would have resulted in duplication of surgeon numbers. The concern was that including private surgeon numbers would vastly overestimate the surgeon number in a particular region.

The private hospital data obtained from the databases was extremely similar to the data provided by the hospitals, giving testament to the rigorous and accurate manner in which private facilities manage their data.

3.5 Variables and characteristics measured

3.5.1 Hospital and bed numbers

The hospital information documented the name of the hospital, the province, the district municipality, the level of care, as well as whether the facility was public or private. The total number of hospital beds and the number of general surgical beds were captured. In smaller hospitals, the facilities did not allocate beds specifically for surgery as the facilities were small, and surgical cases were often referred on to regional facilities for the surgery. In the tertiary level facilities, only beds specifically allocated to general surgery were requested, and other beds allocated to other surgical disciplines such as orthopaedics, obstetrics and gynaecology, maxilla-facial, plastic surgery, urology and neurosurgery were excluded.

3.5.2 Specialist numbers

The number of general surgical specialists were documented for public hospitals only. Many surgeons in public hospitals tended to work only at the hospital of their primary appointment, even though many worked in one or more private hospitals in addition to their public sector commitments. The non-specialist (NSP) general surgeon number was defined as any medical officer, registrar or post-intern level doctor performing general surgical procedures (major or minor cases). These doctors are important in South Africa as well as in other under-developed countries, and are responsible for performing a significant portion of the surgical service including common general surgical procedures such as laparotomy, amputations and hernia repair. Caesarean sections were excluded from the study as these were a measure of the obstetric service provision and should be looked at separately. The same would apply to fracture fixation for orthopaedic care provision. These interventions make up the so-called Bellwether procedures as proposed by the Lancet Commission. [9]

Registrars (residents) were included in the NSP group due to their skill level and surgical decision making capabilities. They are not yet qualified and vary in their experience level over the 4 or 5 year training period. Similarly, ‘career MO’s’ have not fulfilled the CMSA requirements which involves far more training than is available at district or regional level. Registrar numbers would skew the data around training regions, however SP surgeons also tend to remain in urban areas, which further skews these numbers. This will inevitably influence how surgeons were mapped.

3.5.3 Operating theatres

The number of functional operating theatres were also documented in each facility. Operating theatres that were not in use at the hospital for any reason were excluded. These were reported to be non-functional for mostly equipment and staffing reasons or a combination of the above. A facility which had two theatres but only utilized one would be reported as having one functional operating theatre. Few of the rural district level hospitals had operating theatres which were not being utilized due to the lack of surgeons and anaesthetists. None of the hospitals reported lack of use due to the lack of infrastructure such as water or oxygen.

However it was found, particularly at district level that inexperienced anaesthetists and/or surgeons were unable to safely perform surgery or there was no recovery sister. In addition, most district level hospitals did not have functional anaesthetic machines. WHO Situational Analysis Tool provides an in-depth checklist as to what constitutes a functional theatre. The use of the WHO checklist could have been used to better define the functionality of the operating theatres.

3.5.4 Population data

Population estimates were obtained from Stats SA. [60] South African population estimates for each province were based on mid-year 2014 estimates. These were extrapolated from census data obtained during the National Census that took place in 2011.

3.5.5 Data Validation

Internal validity was not confirmed through pilot testing, however the data which was requested from the hospitals was correctly provided given the similarity between cross-referenced databases. There was no need to elaborate on the variables once they were requested. The requested data variables remained the same throughout the data collection process. External validity is not applicable, as this was a descriptive audit of surgical infrastructure and workforce in South Africa. The results obtained were applicable to the South African population but may be representative of other lower and upper middle income countries, with similar resources.

3.6 Data Analysis

Descriptive statistics indicated absolute resource numbers, and tables, graphs and maps were drawn to graphically represent the data. The type of hospital and the number of hospitals were analysed, both according to province and according to district, and a comparison was performed based on the population density. A comparison with 2006 (HST) and/or 2007 (HASA) data was performed to determine any trend in healthcare facility number.

The total number of hospital beds, and the number of surgical beds, for public and private hospitals were compared across provinces and districts. The number of general surgeons for each public hospital, as well as the number of non-specialist general surgeons, were calculated per province and per district. Numbers per 100 000 population, were calculated and represented graphically in tables and figures. The total number of hospital beds, and the number of surgical beds, for public and private hospitals were compared across provinces and districts. The number of general surgeons for each public hospital, as well as the number of non-specialist general surgeons, were calculated per province and per district. Numbers per 100 000 population were calculated and represented graphically in tables and figures.

Inferential statistics were used in order to evaluate provincial differences between surgical resources per 100 000 population. A Chi-squared test was performed on both public and private resources per 100 000 and a p-value of less than 0.05 was assumed to be significant. A p-value of less than 0.05 was used in order to reject the hypothesis that there were no provincial differences in resources.

The number of functional operating theatres were obtained for both public and private hospitals, and number per 100 000 calculated for each province and district. A comparison of the public and private facilities was undertaken with regard to the total numbers, as well as per 100 000 population. The private hospital data were further analysed according to hospital ownership, and a comparison performed with existing 2006 data from the HASA.

A comparison was made with other high and low income countries around the world. A deficit calculation performed in order to estimate the number of beds, theatres and surgeons which would be needed in order to achieve the minimum recommended number of resources to provide a reasonable surgical service.

3.7 Limitations of the study

The data collection period was performed in 2014, making the data 18 months old. Although numbers, particularly surgeon number, could have changed in this time, the database is still relevant in providing much needed data on workforce number and geographic location. Opening or closure of new hospitals was not recorded. The number of hospitals, beds and theatres were static parameters in that they could be assessed and categorized according to public and private hospitals. However, accurate determination of surgeon numbers provided a challenge, as qualified surgeons were able to work in both public (state-owned hospitals) as well as private hospitals.

Several surgeons worked at more than one hospital which made it difficult to ask individual private hospitals to provide the number of surgeons. The HPCSA and CMSA databases were the most accurate source of determining specialist surgeon numbers. The public hospitals were able to provide the specialist and non-specialist surgeon numbers but the inability to accurately capture private surgeon number without duplicating individuals remained a problem. Surgeons tend to transfer between facilities and provinces while training as well as once qualified. Assessing the number of private surgeons for each hospital would allow for workforce density calculations for the areas served by those hospitals. Identifying fulltime specialist surgeons working solely in each sector should have been carried out in order to improve reliability of the data and this is an important limitation.

This audit only captured general surgeon number and not obstetric, orthopaedic or anaesthetist number. In order to accurately assess South Africa's ability to deal with their burden of surgical disease, these other specialities would need to be quantified. In this study, a general surgeon was defined as a medical practitioner who performed a general surgical procedure such as laparotomy, amputation or hernia repair. District level hospitals tended to have medical officers who performed general surgical procedures and were not qualified specialists. These doctors contributed to the surgical service and needed to be factored in.

The criteria for defining a 'functional' operating theatre was another potential limitation. If theatres were not being used for any reason, i.e. technical or staffing reasons, these were not elaborated upon and therefore not validated.

3.8 Ethical Considerations

This study was approved by the Human Research and Ethics Committee at the University of Cape Town. (HREC 515/2013, 515/2014, 515/2015)_ (Appendix E) and the Departmental Research Committee of the Department of Surgery. The research complies with the latest version of the Declaration of Helsinki as well as the Department of Health principles, structures and processes. A declaration of no conflict of interest was made.

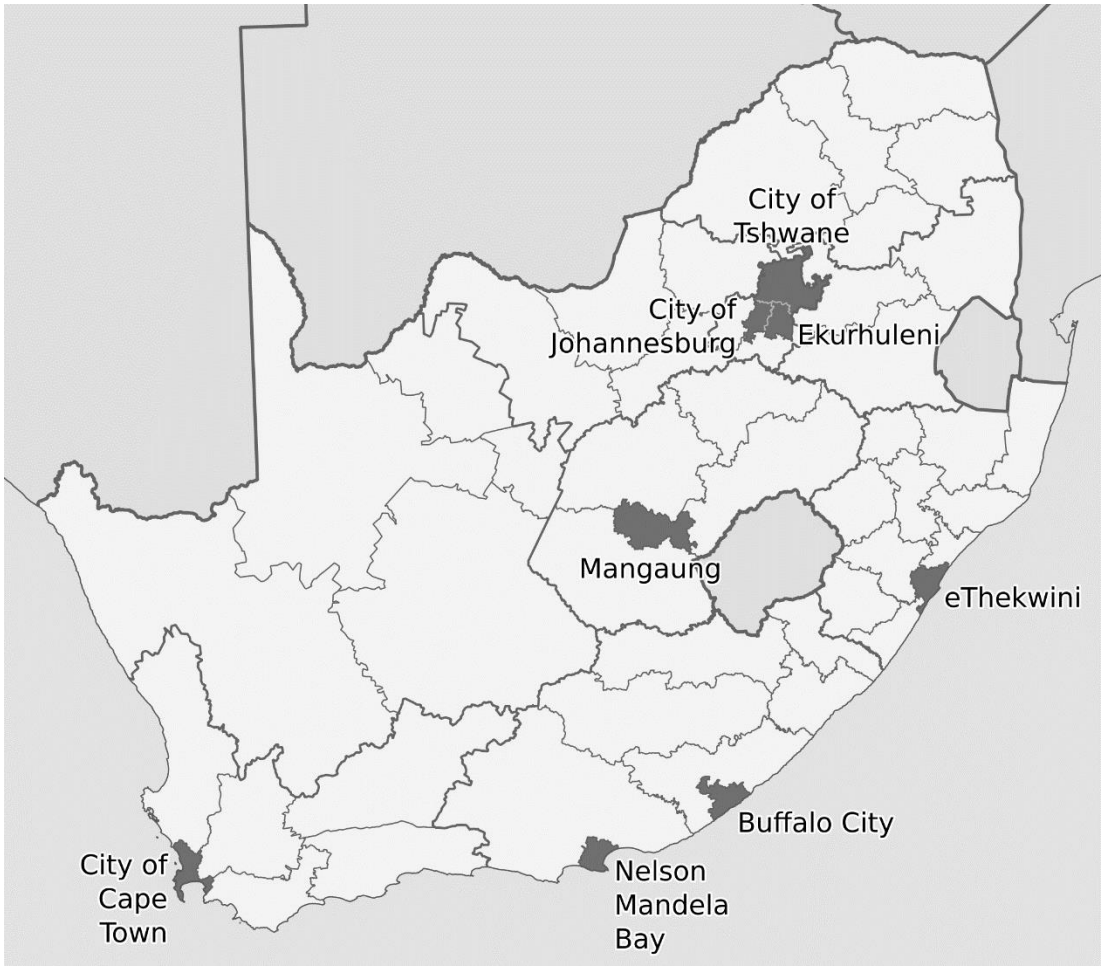
Chapter 4: Research Findings – National Results for South Africa

4.1 Geographical profile

South Africa is situated at the southernmost tip of Africa and measures approximately 1 213 million square kilometres with a population of 54 million inhabitants in 2014. [62] Its neighbouring countries include Namibia, Botswana, Zimbabwe, Mozambique, Swaziland and Lesotho. The World Bank has designated South Africa an UMIC with a GDP of 6 619 $US per capita. South Africa was classified as a LMIC for 61 years according to a report by Felip et al and reportedly changed it designation in 2011. [63] The total GDP for 2014 was US$ 350 billion with an estimated growth rate of 1.5%. [62]

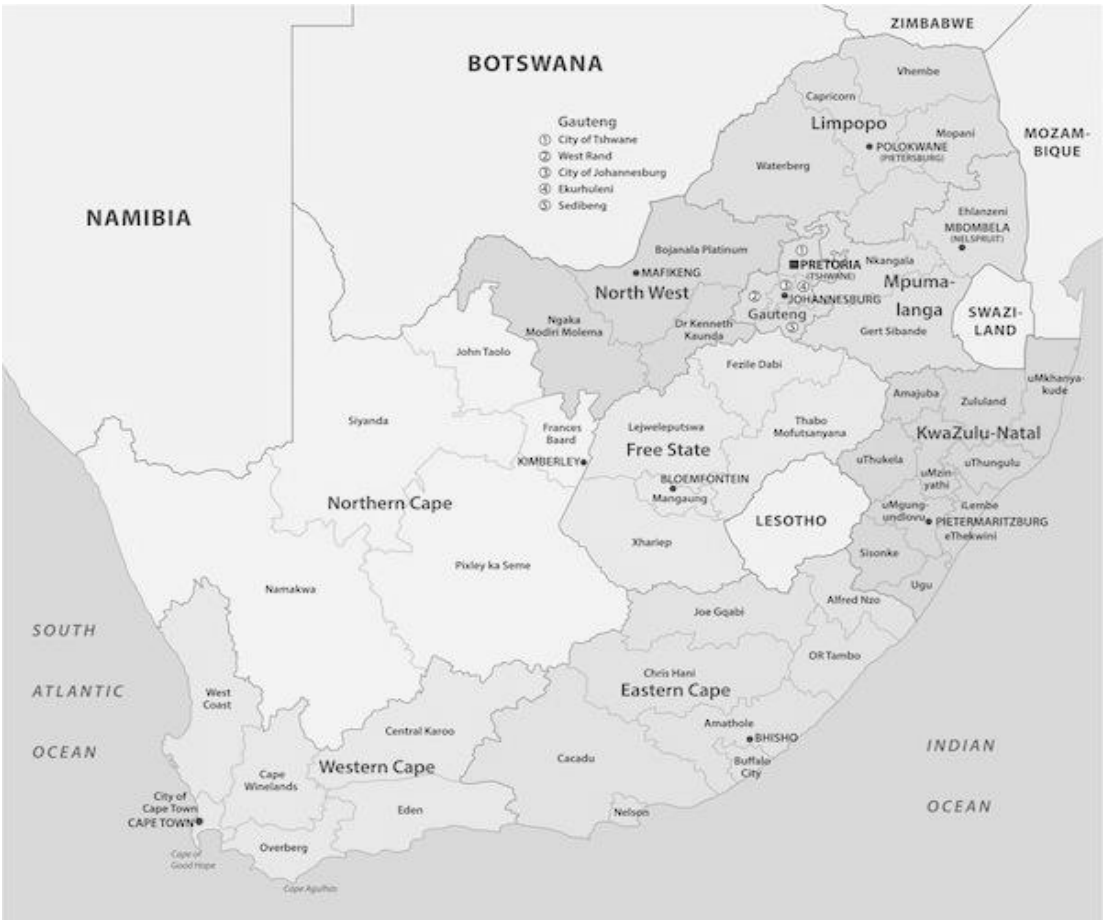
There are eleven official languages with 52 municipalities (metropolitan and district) in nine provinces. The primary administrative divisions of South Africa are the nine provinces. The provinces are divided into metropolitan and district municipalities, with the district municipalities being further divided into local municipalities. Metropolitan and local municipalities are divided into wards. Since the fall of Apartheid in 1994, South Africa has been divided into nine provinces: the Eastern Cape, the Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, North West, the Northern Cape and the Western Cape. The boundaries of the provinces have been altered twice by constitutional amendment. [72]

Eight of South Africa's largest cities are governed as metropolitan municipalities, which govern all municipal functions in their areas, compared with the divided responsibilities in areas with the district system. [72] The eight metropolitan municipalities are: Buffalo City (East London), City of Cape Town (Cape Town), Ekurhuleni (East Rand), eThekwini (Durban), City of Johannesburg (Johannesburg), Mangaung (Bloemfontein), Nelson Mandela Bay (Port Elizabeth), and City of Tshwane (Pretoria). (See Map 1).



Map 1: Metropolitan municipalities of South Africa. [1]

Outside the metropolitan municipalities, the rest of South Africa is divided into 44 district municipalities. (See Map 2). These cover large regions of the provinces, and are in turn divided into local municipalities. The district municipalities are divided into a total of 226 local municipalities. In general, a local municipality includes one or more towns and the surrounding villages and rural areas.



Map 2: Provincial map of South Africa showing metropolitan and district municipalities. [2]

South Africa was well-known for its relatively peaceful political transition with the fall of the Apartheid regime in 1994. As a result of mass oppression and segregation, many South Africans are still suffering from the consequences resulting in lack of access to safe and affordable health care. Slow service delivery is still problematic and many South Africans in rural areas migrate to urban areas in search of basic treatments.

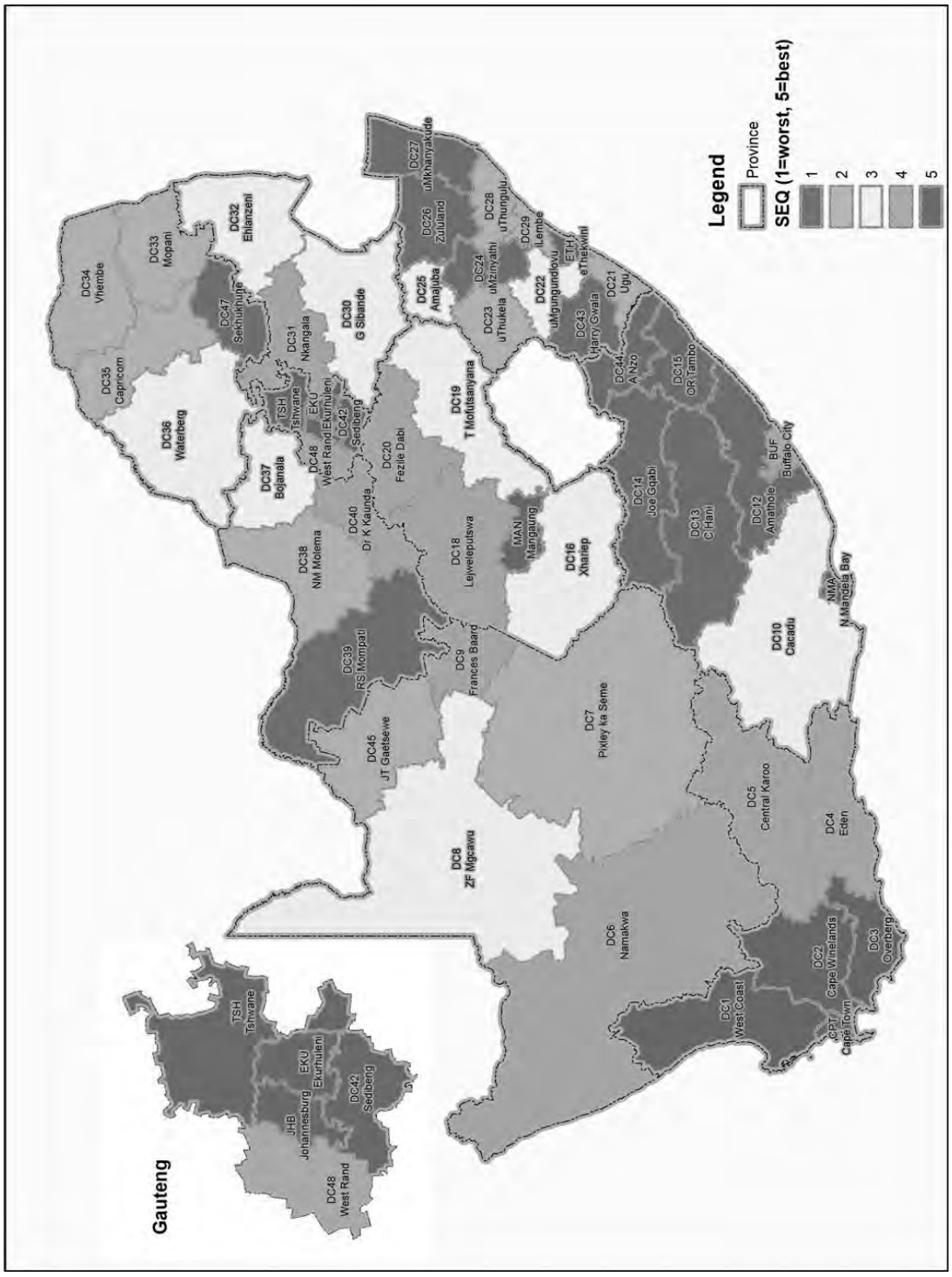
4.2 Health metrics

Health metrics for South Africa include a life expectancy of 59.1 years and 63.1 years for males and females without HIV, respectively. [60] Other important health metrics include an IMR of 34.4 per 1 000 live births, a MMR of 133.3 per 100 000 live births, and a caesarean section rate of 24.4%. [61]

4.3 Socioeconomic ranking

One of the socio-economic indicators used in the District Health Barometer (DHB) is a deprivation index. This index is a measure of relative deprivation across districts within South Africa, and is a composite measure derived from a set of variables, [73] which are sourced from the 2001 census and 2005 GHS data. Higher values of the deprivation index denote higher levels of social and material deprivation. [74]

Based on the deprivation index, the 52 districts have been ranked into socio-economic quintiles. The quintiles are labelled 1 to 5 and each contains 20% of all districts, either 10 or 11 districts. Those districts that fall in quintile 5 are the top 20% least deprived (best-off) districts. The 10 districts in quintile 1 contain people with the lowest socio-economic status and are the most deprived (worst off). [74] Map 3 shows all districts in South Africa, and their ranking into socio-economic quintiles (SEQ).



Map 3: Districts in South Africa with ranking from best to worst municipality according to socio-economic quintile (SEQ). [3]

4.4 Overview of national results per 100 000 population

Public hospitals are classified as district, regional, provincial tertiary, national central and specialized according to the National Health Act of 2003. [75] Private hospitals are classified as for profit or not-for profit private hospitals, with the majority being managed as for profit hospitals and being accessible only to those who are able to afford health insurance or medical aid cover.

Table 13 demonstrates a comparative of surgical resources per 100 000 in South Africa. Specialist (SP) general surgeons are those registered in the country whereas non-specialist general surgeons (NSP) are those working in public hospitals exclusively. Total hospital beds and theatres comprise both public and private sector resources.

Table 13: Comparative of provincial surgical resources per 100 000 population.

Province	Population 2014	Public hospitals	Private hospitals	Total hospitals	Total beds	Surgical beds	SP General surgeon	NSP General surgeon	Theatres
EC	6 786 900	1.11	0.20	1.31	183.43	37.62	0.78	2.80	2.67
FS	2 786 800	1.08	0.57	1.65	216.80	49.62	2.15	3.23	4.49
GP	12 914 800	0.20	0.65	0.86	225.95	56.44	2.30	2.70	5.50
KZN	10 694 400	0.50	0.29	0.79	214.02	43.40	1.89	2.33	3.23
LP	5 630 500	0.66	0.12	0.80	138.83	22.68	0.30	3.64	1.43
MP	4 999 300	0.56	0.24	0.80	123.50	25.00	0.46	1.78	1.98
NC	1 166 700	1.46	0.34	1.79	172.71	35.83	0.85	4.46	2.48
NW	3 676 300	0.54	0.38	0.92	132.66	32.72	0.60	2.91	2.47
WC	6 116 300	0.65	0.55	1.21	175.22	44.70	3.41	4.18	5.01
RSA	54 772 000	0.60	0.40	1.00	186.64	41.55	1.78	2.90	3.59

4.5 Hospital number according to level of care, region and sector

There were a total of 544 hospitals included in the study. There were 217 private hospitals and 327 public hospitals. This is very similar to the Health System Trust (HST) data from 2014 which documented 203 private hospitals and 331 public hospitals.

The provincial breakdown of private and public hospitals is shown in Figure 1. The largest total number of hospitals were in the Gauteng Province (n=111) and the fewest were in the Northern Cape (n=21).

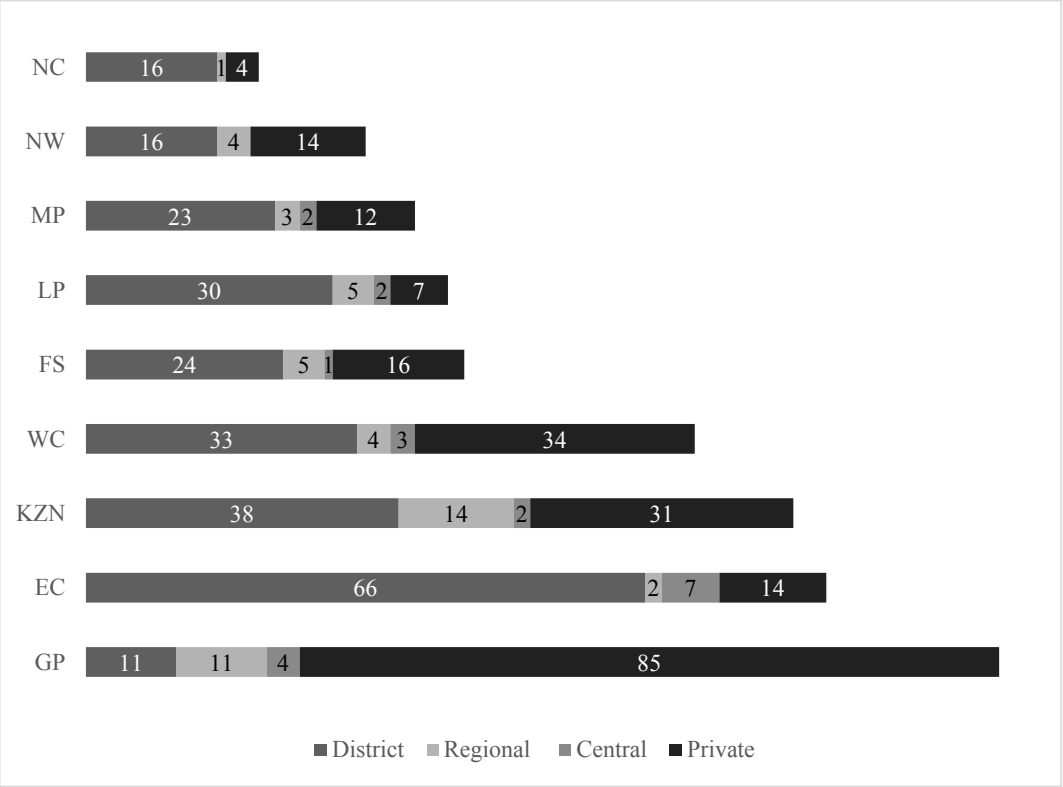


Figure 1: Provincial breakdown of public and private hospitals in South Africa.

The total number of hospitals per district are represented in Map 4, which shows the largest number were located in the metropolitan areas of South Africa. _ (Appendix F).

The largest number of private hospitals were located in Gauteng (n= 85), Western Cape (n=34) and Kwa-Zulu Natal (n=31). Limpopo Province (n=7) and the Northern Cape (n=4) had the lowest number of private hospitals. Figure 2 represents the private hospital number according to province and district respectively. See Map 5 _ (Appendix F).

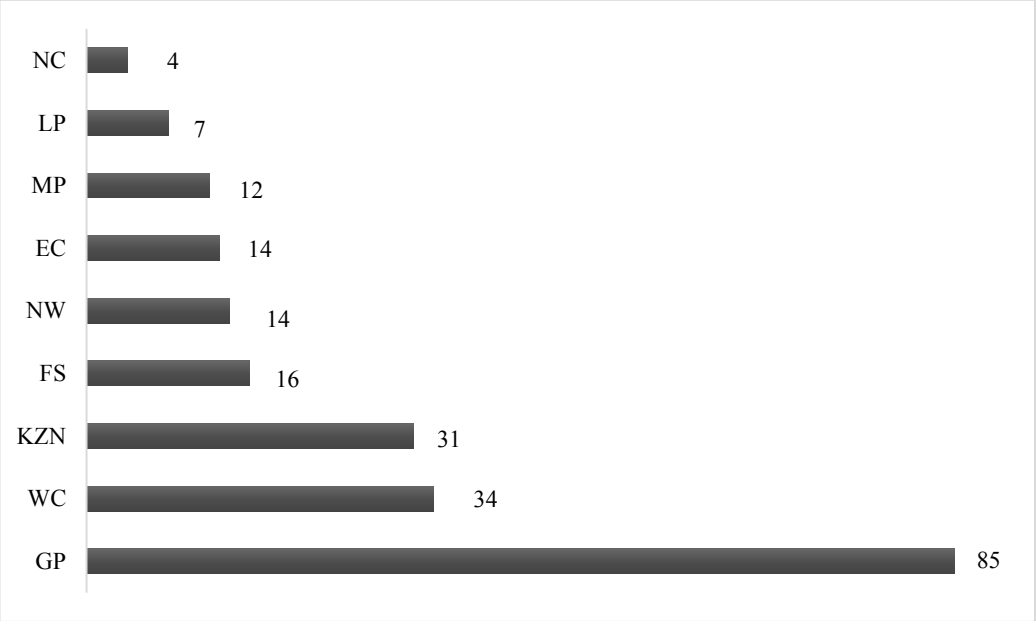


Figure 2: Private hospitals in South Africa according to province.

Of the 327 public hospitals, 257 (79%) were district hospitals, 49 (15%) were regional hospitals and 21 (6%) were central or level three hospitals. The 20 central or level three hospitals were comprised of eight national central hospitals and 12 provincial tertiary hospitals. The largest number of public hospitals were in the EC (n=75), although most of these were district hospitals. This was followed by KZN (n=54), WC (n=40), LP (n=37) and FS (n=30) as shown in Figure 3. The lowest number of public hospitals were in NW (n=20) and NC (n=17). There were no central hospitals in NC and NW, and only one in FS. KZN (n=14) and GP (n=11) had the largest number of regional hospitals. Map 6 represents the number of public hospitals per district. _ (Appendix F).

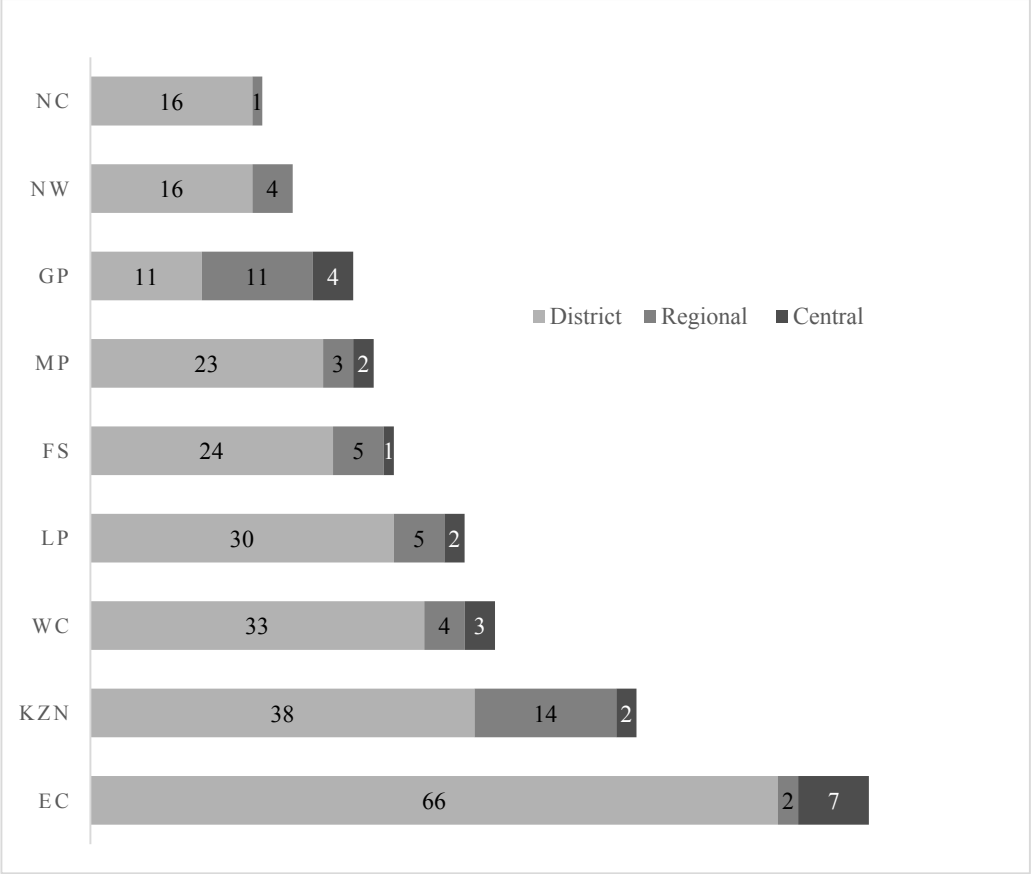


Figure 3: Public hospitals in South Africa according to province and hospital type (central, regional and district level).

4.5.1 Hospitals per 100 000 population

Population estimates were obtained from Stats SA and were based on the 2014 estimates. [60] KZN and GP had the largest populations, and NC, FS and NW had the smallest populations. (See Table 14).

Table 14: South African population estimates according to province (Statistics SA mid-year 2014 estimates).

Province	Population (2014)	Percentage (%)
EC	6 786 900	12.6
FS	2 786 800	5.2
GP	12 914 800	23.9
KZN	10 694 400	19.8
LP	5 630 500	10.4
MP	4 999 300	7.8
NC	1 166 700	2.2
NW	3 676 300	6.8
WC	6 116 300	11.3
RSA	54 772 000	100

The number of hospitals per 100 000 are shown in Table 15. It is important to note that accessibility to private hospitals was limited to around 16% [68, 69] of the population as part of the current health scheme in South Africa. When private hospitals were removed as part of the calculation, a very different landscape is shown. Interestingly the NC, with the smallest population and the lowest number of hospitals (n=21), had the highest number of hospitals per population (1.79 per 100 000). This was followed by the Free State (1.65 per 100 000) and the Eastern Cape (1.34 per 100 000). These provinces are seen as rural or less urbanized provinces. GP and KZN, the two provinces with the largest populations and the most total number of hospitals, had relatively low numbers of hospitals per population (0.86 and 0.79 per 100 000 respectively).

Table 15: Provincial distribution of total hospitals per 100 000 population for 2014.

Province	Hospitals	Private	Public	Hospitals per 100 000
EC	89	14	75	1.31
FS	46	16	30	1.65
GP	111	85	26	0.86
KZN	85	31	54	0.79
LP	45	7	37	0.80
MP	40	12	28	0.80
NC	21	4	17	1.79
NW	34	14	20	0.92
WC	74	34	40	1.21
RSA	544	217	327	1.00

The number of public hospitals per 100 000 are shown in Table 16. Once again, the NC, EC and FS were the provinces with the most facilities per 100 000. Gauteng had the fewest public hospitals per population (0.2 per 100 000), which was far below the national average of 0.60. When the 85 private facilities were factored in, it still had fewer (0.86 per 100 000) than the national average of total hospitals (1.00 per 100 000). This was despite having the largest overall number of hospitals in the country.

Table 16: Provincial distribution of public hospitals per 100 000 for 2014.

Province	Public	Hospitals per 100 000
EC	75	1.11
FS	30	1.08
GP	26	0.20
KZN	54	0.50
LP	37	0.66
MP	28	0.56
NC	17	1.46
NW	20	0.54
WC	40	0.65
RSA	327	0.60

4.6 Total hospital bed number

There were 102 229 hospital beds in South Africa. This excluded 'special' beds in specialized TB hospitals, psychiatric hospitals and rehabilitation facilities. Table 17 demonstrates the bed numbers according to the hospital type for each province. Gauteng had the largest overall bed numbers with 29 181 beds, comprising almost equal numbers of public and private beds. The large number of public hospital beds were as a consequence of the four tertiary or central hospitals and 11 regional hospitals in the province. These hospitals typically had more beds as per their definition. The fewest total hospital bed numbers were found in the Northern Cape (n=2 015) and North West Province (n=4 877). These provinces had no central hospitals and very few private beds.

Table 17: Total bed number per province.

Hospitals	EC	FS	GP	KZN	LP	MP	NC	NW	WC	RSA
District	6 252	1 568	2 722	8 399	4 431	3 227	960	1 396	2 659	31 614
Regional	555	1 606	6 412	8 329	1 579	915	694	2 016	1 172	23 278
Central	4 026	543	5 721	1 359	1 231	650	0	0	2 495	16 025
Public	10 833	3 717	14 855	18 087	7 241	4 792	1 654	3 412	6 326	70 917
Private	1 684	2 325	14 326	4 802	576	1 382	361	1 465	4 391	31 312
Total	12 517	6 042	29 181	22 889	7 817	6 174	2 015	4 877	10 717	102 229

The data collected during 2014 had no available comparison at the time. The Health System Trust released their 2014 hospital and bed number the following year. (Table 18). The comparative bed numbers were similar. However there was no indication of individual hospital data to assess any differences.

Table 18: Total bed number per province (HST data).

Hospitals	EC	FS	GP	KZN	LP	MP	NC	NW	WC	RSA
District	6 120	1 598	2 538	8 637	4 153	2 796	583	1 494	2 784	30 703
Regional	2 122	1 195	4 425	7 091	1 533	840	141	1 953	1 384	20 684
Central	2 142	1 245	8 225	1 841	1 003	725	657	471	2 631	18 940
Public	10 384	4 038	15 188	17 569	6 689	4 361	1 381	3 918	6 799	70 327
Private	1 653	2 325	14 326	4 833	576	1 382	361	1 465	4 391	31 312
Total	12 037	6 363	29 514	22 402	7 265	5 743	1 742	5 383	11 190	101 639

Total hospital bed number is represented graphically in Figure 4 _ (Appendix F). The distribution of the total number of beds, the number of public hospital beds and the number of private hospital beds per district is shown graphically in Maps 7, 8 and 9 _ (Appendix F). This clearly shows that the largest number of beds, including total, public and private beds, were found in the major metropolitan areas.

4.6.1 Total bed number per 100 000 population

A more accurate assessment of the total bed numbers, like the other surgical indicators, is total bed number per 100 000. (Table 19). The largest number of total beds per population were found in Gauteng (225.95 per 100 000), followed by the Free State (216.80 per 100 000) and KwaZulu-Natal (214.03 per 100 000). The fewest were found in Mpumalanga (123.50 per 100 000) and Limpopo (138.83 per 100 000).

Table 19: Total bed number per 100 000 population, by province.

Hospitals	EC	FS	GP	KZN	LP	MP	NC	NW	WC	RSA
Public	10 833	3 717	14 855	18 087	7 241	4 792	1 654	3 412	6 326	70 917
Private	1 684	2 325	14 326	4 802	576	1 382	361	1 465	4 391	31 312
Total	12 517	6 042	29 181	22 889	7 817	6 174	2 015	4 877	10 717	102 229
Per capita	184.43	216.80	225.95	214.03	138.83	123.50	172.71	132.66	175.22	186.64

Analysis of the number of public beds per 100 000 demonstrates an even more disproportionate image. (Table 20). The number of public beds per population in Mpumalanga fell to 95.5 per 100 000 and was followed by the Northern Cape with 92.81 public hospital beds per 100 000. The Western Cape and Gauteng were third and fourth poorest when it comes to this resource, where both provinces are traditionally seen as wealthy.

Table 20: Total public bed number per 100 000 population, by province.

Hospitals	EC	FS	GP	KZN	LP	MP	NC	NW	WC	RSA
Public	10 833	3 717	14 855	18 087	7 241	4 792	1 654	3 412	6 326	70 917
Per 100 000	159.61	133.38	115.02	169.12	128.60	95.85	141.76	92.81	103.42	129.48

4.7 Surgical bed number

There were a total of 22 758 designated general surgical beds in South Africa. Over half (53%) of these were in the public sector. A large proportion of public surgical beds were concentrated in Gauteng, the Western Cape and KwaZulu-Natal. The largest number of private hospital surgical beds were in GP, whereas the largest number of public hospital surgical beds were in KZN. (See Table 21 and Figure 5). There were only 418 designated surgical beds in the NC.

Table 21: Surgical bed number per province.

Hospital	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
District	793	559	428	1 670	715	605	146	220	455	5 591
Regional	152	336	1 176	1 522	235	132	146	407	210	4 316
Central	945	60	848	354	130	107	0	0	509	2 953
Public	1 890	619	2 452	3 192	1 080	844	292	627	1 174	12 170
Private	663	764	4 837	1 459	197	406	126	576	1 560	10 578
Total	2 553	1 383	7 289	4 651	1 277	1 250	418	1 203	2 734	22 758

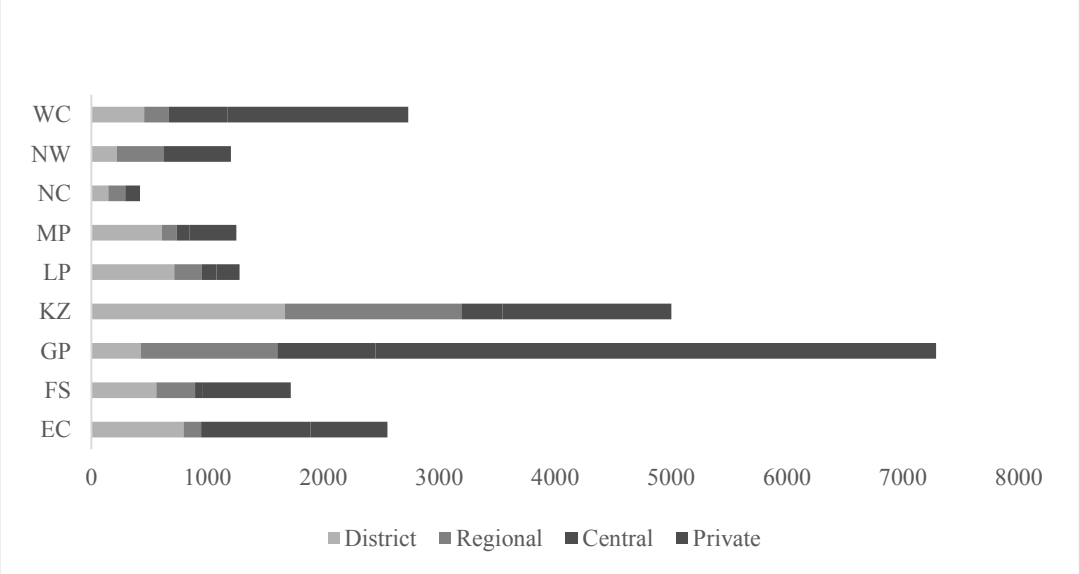


Figure 5: Surgical bed number per province.

The distribution of total surgical beds, public hospital surgical beds and private hospital surgical beds according to the district is shown graphically in Maps 10, 11 and 12, respectively_ (Appendix F). Again this shows that the surgical beds are concentrated in the metropolitan areas.

The surgical beds comprised 17.2% of the total hospital beds, with a range of 14.9% (Limpopo) to 26.7% (Western Cape). In the private sector, the surgical beds made up a larger proportion of the total beds (33.8%), with a range of 29.3% (Mpumalanga) to 39.4% (Eastern Cape). Overall, in South Africa, surgical beds comprised 22.3% of the total hospital beds. (Table 22).

Table 22: Surgical bed number as a proportion of total bed number.

Province	Total bed number	Total surgical bed number	Proportion of surgical beds to total beds (%)	Total bed number	Total surgical bed number	Proportion of surgical beds to total beds (%)	Total bed number	Total Surgical bed number	Proportion of surgical beds to total beds (%)
	Public			Private			(Public and Private)		
EC	10 833	1 890	17.5	1 684	663	39.4	12 517	2 553	20.4
FS	3 717	619	16.7	2 325	764	32.9	6 042	1 383	22.9
GP	14 855	2 452	16.5	14 326	4 837	33.7	29 181	7 289	25.0
KZN	18 087	3 192	17.7	4 802	1 449	30.2	22 920	4 651	20.3
LP	7 241	1 080	14.9	576	197	34.2	7 817	1 277	16.3
MP	4 792	844	17.6	1 382	406	29.3	6 174	1 250	20.2
NC	1 654	292	17.7	361	126	34.9	2 015	418	20.7
NW	3 412	627	18.3	1 465	576	39.3	4 877	1 203	24.7
WC	4 391	1 174	26.7	4 391	1 560	35.5	10 717	2 734	25.5
RSA	70 917	12 170	17.2	31 312	10 578	33.8	102 229	22 758	22.3

4.7.1 Surgical bed number per 100 000 population

The total number of surgical beds were 41.55 per 100 000, and ranged from 22.68 in Limpopo to 56.44 in Gauteng. The combination of public and private beds gave a skewed perception of the actual accessibility, and therefore, a more accurate calculation indicating true access would be to look at public sector surgical beds separately. (Table 23).

Table 23: Total surgical bed number per 100 000 population, by province.

	EC	FS	GP	KZN	LP	MP	NC	NW	WC	RSA
Public	1 890	619	2 452	3 192	1 080	844	292	627	1 174	12 170
Private	663	764	4 837	1 449	197	406	126	576	1 560	10 578
Total	2 553	1 383	7 289	4641	1 277	1 250	418	1 203	2 734	22 758
Per 100 000	37.62	49.62	56.44	43.40	22.68	25.00	35.83	32.72	44.70	41.55

When private surgical beds were eliminated, the ratio of surgical beds per population was halved to 22.22 per 100 000, and ranged from 16.88 per 100 000 in MP, to 27.84 in the EC. (Table 24). The total provincial population was used to calculate the number of public surgical beds per 100 000, and not only those with medical aid cover. The reason was that a significant proportion of uninsured patients access private healthcare, which would make this calculation inaccurate. Chetty performed a similar calculation when looking at the number of hospital beds, and used the total provincial population to calculate the number of public hospital beds per 100 000. [65]

Table 24: Public surgical bed number per 100 000 population, by province.

	EC	FS	GP	KZN	LP	MP	NC	NW	WC	RSA
Public	1 890	619	2 452	3 192	1 080	844	292	627	1 174	12 170
Per 100 000	27.84	22 .21	18.98	29.85	19.18	16.88	25.03	17.06	19.19	22.22

4.8 Operating theatres

There were a total of 1 969 functional operating theatres in South Africa, with 54% of these in the private sector and the remaining 46% in the public sector. Of the 899 operational theatres in the public sector, the least were in the Northern Cape (n=17) and the most were in Gauteng (n=211). Similarly, there were 1 070 theatres in private hospitals, with fewest in the Northern Cape (n=12) and the most in Gauteng (n=500). (Table 25 and Figure 6).

Table 25: Total number of operating theatres per province.

Province	Public	Private	Total
EC	118	63	181
FS	65	60	125
GP	211	500	711
KZN	183	162	345
LP	63	18	81
MP	60	39	99
NC	17	12	29
NW	46	45	91
WC	136	171	307
Total	899	1 070	1 969

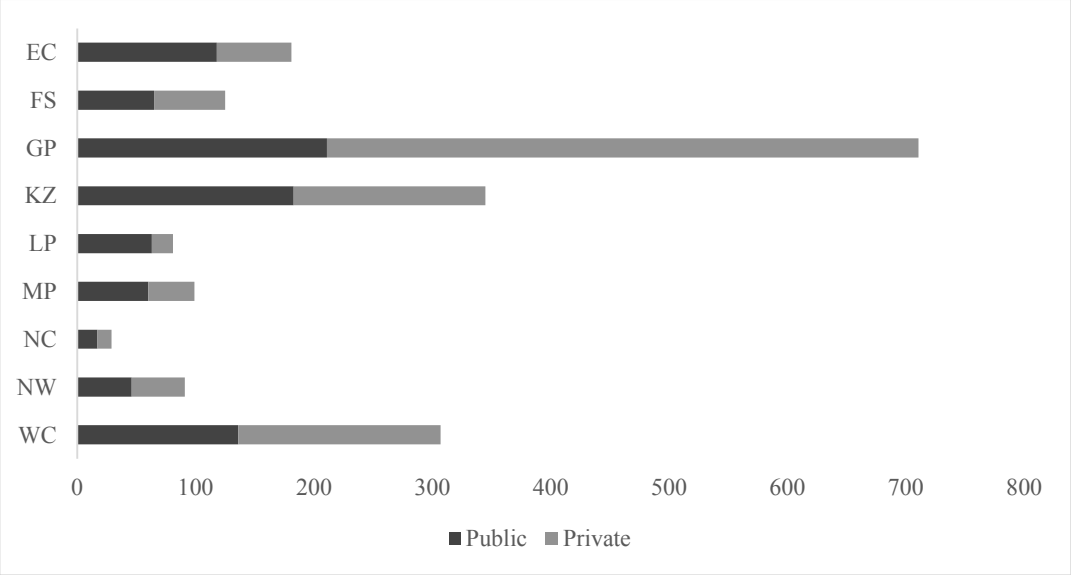


Figure 6: Operating theatre number per province.

The distribution of total operating theatres, public hospital operating theatres and private hospital operating theatres per district is shown graphically in Maps 13, 14 and 15, respectively _ (Appendix F). This shows that operating theatres were concentrated in the metropolitan areas.

4.8.1 Number of operating theatres per 100 000 population

The fewest theatres were in Limpopo (1.44 per 100 000), whereas the most were in Gauteng (5.50 per 100 000) and the Western Cape (5.01 per 100 000). Overall, South Africa had 3.59 functional operating theatres per population.

Table 26: Total number of operating theatres per 100 000 population, by province.

Province	Public	Private	Total	Per 100 000
EC	118	63	181	2.67
FS	65	60	125	4.49
GP	211	500	711	5.50
KZN	183	162	345	3.23
LP	63	18	81	1.44
MP	60	39	99	1.98
NC	17	12	29	2.48
NW	46	45	91	2.47
WC	136	171	307	5.01
Total	899	1 070	1 969	3.59

When private theatres were excluded, in order to calculate the number of public operating theatres per 100 000, the theatre number per population fell to 1.64 per 100 000. (Table 27).

Table 27: Number of public operating theatres per 100 000 population.

Province	Public	Per 100 000
EC	118	1.74
FS	65	2.33
GP	211	1.63
KZN	183	1.71
LP	63	1.12
MP	60	1.20
NC	17	1.45
NW	46	1.25
WC	136	2.22
Total	899	1.64

4.9 Number of general surgeons

There were 894 specialist general surgeons registered in 2014. The various databases which were used showed different numbers, but with cross-referencing of the HPCSA, the CMSA and Medpages, as well as unpublished data from Professor Veller (University of Witwatersrand, Johannesburg) [76], the current numbers were reached. Most surgeons were located in the metropolitan areas of Gauteng, the Western Cape and KwaZulu-Natal. There were approximately 376 surgeons working full-time in the public hospitals (with or without RWOPS). There were 1 587 non-specialist surgeons (registrars and medical officers) who were performing surgery around South Africa, giving a total of 1 963 general surgeons (specialist and non-specialist) working in the public sector and 2 481 general surgeons in total. (Table 28 and Figure 7).

Table 28: General surgeon number per province.

Province	Specialist general surgeons registered in province (HPCSA)	Specialist general surgeons working in public hospitals	Non-specialist surgeons working public hospitals	Total specialist and non-specialist general surgeons in public hospitals
WC	209	77	256	333
GP	298	158	349	507
FS	60	14	90	104
KZN	203	68	249	317
NC	10	5	52	57
EC	53	29	190	219
NW	22	14	107	121
MP	23	5	89	94
LP	16	6	205	211
Total	894	376	1 587	1 963

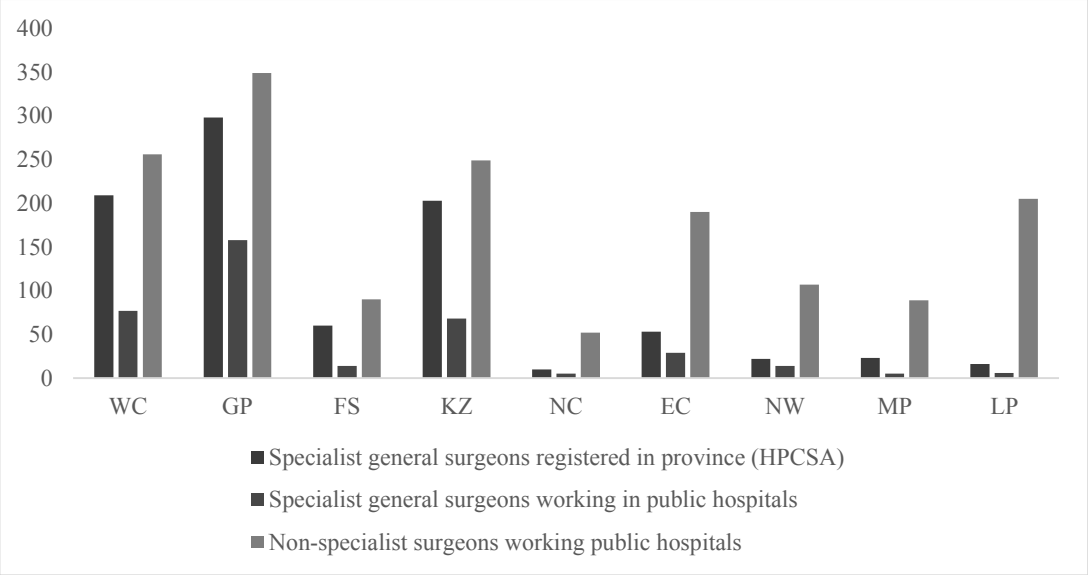


Figure 7: Specialist and non-specialist general surgeons working in public hospitals per province.

General surgeon number (specialist and non-specialist general surgeons according to the various districts) are shown graphically in Maps 16 and 17, respectively _ (Appendix F). As expected, the largest concentration of surgeons are located in the metropolitan areas.

4.9.1 Number of general surgeons per 100 000 population

There were 1.78 general surgeons per 100 000 in South Africa. These were specialist surgeons who were registered on the various databases in 2014. This ranged from 0.30 per 100 000 in LP, to 3.41 per 100 000 in WC.

Specialist general surgeons working in the public hospitals provided surgical services to 84% of South Africans and comprised 0.69 per 100 000, with 0.1 per 100 000 in MP and 1.26 per 100 000 in the WC. These specialists comprised 42% (n=317) of the total number of specialist general surgeons who were registered in 2014.

Non-specialist general surgeons worked exclusively in public hospitals. There were 2.90 non-specialist general surgeons per 100 000, with 1.78 per 100 000 in MP and 4.18 per 100 000 in the WC. There were 3.58 specialist and non-specialist general surgeons working in the public sector per 100 000. The largest number of specialist and non-specialist surgeons per population (working in the public sector), were located in the WC (5.44 per 100 000) and NC (4.89 per 100 000). This was despite the NC being a large rural province. The fewest number of specialist and non-specialist general surgeons in the public sector, were located in KZN (2.96 per 100 000) and MP (1.88 per 100 000). (Table 29).

Table 29: Number of general surgeons per 100 000 population.

Province	SP general surgeons registered in 2014	SP general surgeons per 100 000	SP general surgeons working in public hospitals	SP general surgeons working in public hospitals per 100 000	NSP general surgeons working in public hospitals	NSP general surgeons working in public hospitals per 100 000	Total SP and NSP general surgeons working in public hospitals	Total general surgeons working in public hospitals per 100 000
WC	209	3.41	77	1.26	256	4.18	333	5.44
GP	298	2.30	158	1.22	349	2.70	507	3.93
FS	60	2.15	14	0.50	90	3.23	104	3.73
KZN	203	1.89	68	0.64	249	2.33	317	2.96
NC	10	0.85	5	0.42	52	4.46	57	4.89
EC	53	0.78	29	0.43	190	2.80	219	3.22
NW	22	0.60	14	0.38	107	2.91	121	3.29
MP	23	0.46	5	0.10	89	1.78	94	1.88
LP	16	0.30	6	0.11	205	3.64	211	3.75
Total	894	1.78	376	0.69	1 587	2.90	1 963	3.58

The majority of specialist general surgeons (65.6%) worked in the central hospitals, which generally were located in metropolitan areas. Of the specialist general surgeons, only 28% worked in the regional hospitals and even fewer, 7%, worked at the numerous district level hospitals. Table 30. (Figure 8 _ Appendix F).

Table 30: Specialist general surgeons according to hospital level, per province.

Province	District hospital	Regional hospital	Central hospitals
EC	1	0	28
FS	0	9	5
GP	2	27	129
KZN	0	46	22
LP	1	2	3
MP	0	1	4
NC	1	4	0
NW	8	6	0
WC	10	11	56
RSA	23	106	247
Proportion of total	7.4%	28.2%	65.6%

Conversely, non-specialist general surgeons worked predominately at district hospitals (54.5%). Nearly one third (28.6%) of non-specialist general surgeons worked at central hospitals, along with the majority of specialist general surgeons (65.6%), leaving the regional hospitals without a strong surgical workforce. Table 31. (Figure 9 _ Appendix F).

Table 31: Non-specialist general surgeons according to hospital level, per province.

Province	District hospital	Regional hospital	Central hospitals
EC	115	6	69
FS	52	16	22
GP	62	75	212
KZN	161	73	15
LP	167	8	30
MP	67	12	10
NC	45	7	0
NW	57	50	0
WC	140	20	96
RSA	866	267	454
Proportion of total	54.6%	16.8%	28.6%

The smallest proportion of specialist general surgeons working in public practice were in MP (21.73%), whereas the largest proportion were in the NW (63.63%). (Table 32). Figure 10_ (Appendix F).

Table 32: Proportion of specialist general surgeons working in public hospitals, per province.

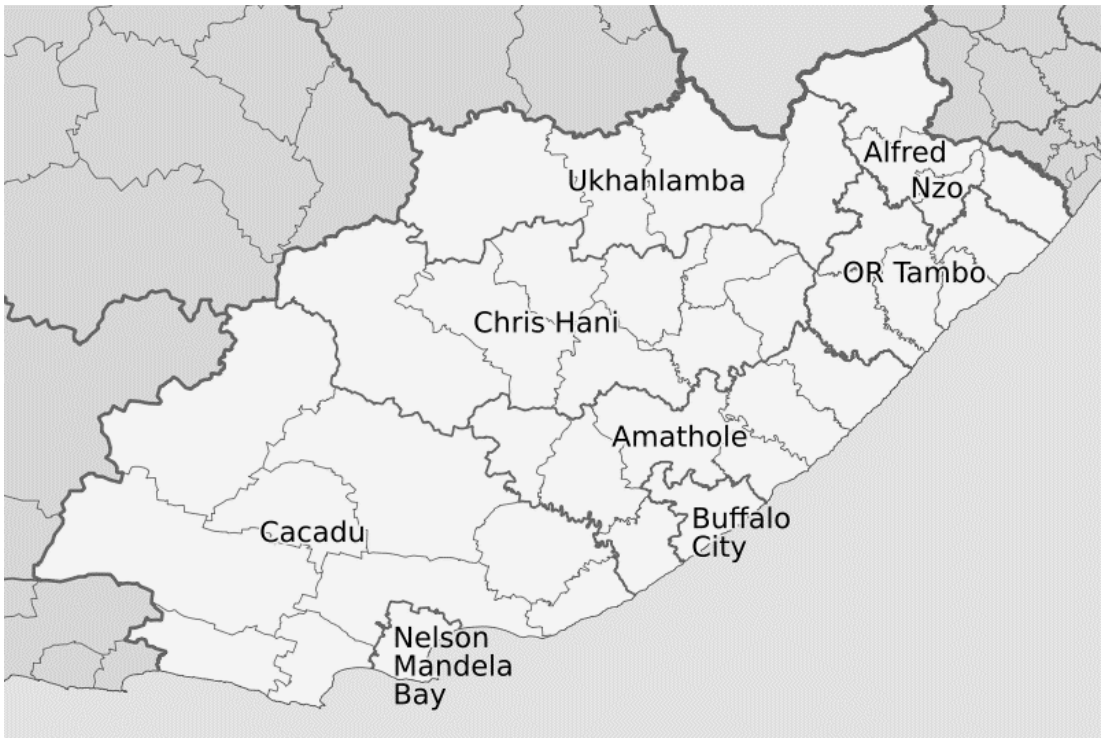
Province	Specialist general surgeons registered in province (2014)	Specialist general surgeons working in public hospitals	Proportion of specialist general surgeons working in public hospitals
WC	209	77	36.84
GP	298	158	53.02
FS	60	14	23.33
KZN	203	68	33.50
NC	10	5	50.00
EC	53	29	54.72
NW	22	14	63.63
MP	23	5	21.73
LP	16	6	37.50
Total	894	376	42.06

4.10 Comparative data of surgical resources per district municipality

Table 33 demonstrates the number of surgical resources for each of the 52 district municipalities in South Africa, whereas Table 34 demonstrates the same per capita. _ (Appendix F).

5.1 Eastern Cape Provincial Resources

The Eastern Cape is situated in the south-eastern part of South Africa and comprises eight district municipalities. (Map 18). There are approximately 6 786 900 inhabitants and it is one of the poorest provinces in the country. Only 11.4% of the population have medical aid coverage, which is the second lowest in South Africa and far below the national average of 16%. [64]



Map 18: District Municipality map of the Eastern Cape. [4]

Alfred Nzo District:

Alfred Nzo District is located in the north-eastern corner of the Eastern Cape. The district fell within the lowest SEQ, with a high unemployment rate of 43.5%, and a medical scheme coverage estimated to be 3.5%, which was the lowest in the country. [64]

There were three district hospitals (0.37 hospitals per 100 000 with 488 public hospital beds (59.39 per 100 000), which was fewer than in 2007. There were 94 surgical beds (11.44 per 100 000), which was the lowest in the province. There were no specialist general surgeons, and only five non-specialist general surgeons working in the public sector (0.61 per 100 000), serving a population of 821 756. There were four operating theatres (0.49 per 100 000) in the public sector, which was the fewest in the province. There was one private hospital in Matatiele (0.12 per 100 000) with 31 hospital beds (3.77 per 100 000), ten surgical beds (1.22 per 100 000), but without a functional operating theatre.

Buffalo City District:

Amathole district was divided into Buffalo City and Amathole districts in 2011. Buffalo City Metro is situated on the east coast of the Eastern Cape. The district fell into SEQ 4, which was amongst the wealthier districts, and its medical scheme coverage is estimated to be 9.6%. [64] There were four district hospitals and two level three hospitals (0.76 per 100 000), with 2 074 public hospital beds (275.35 per 100 000), 375 public surgical beds (49.70 per 100 000), and 17 operating theatres (2.26 per 100 000). There were 11 specialist general surgeons (1.46 per 100 000) and 30 non-specialist general surgeons (working in the public sector) for 753 213 people. There were no private hospitals in Buffalo City, despite it being one of the wealthier districts. The medical aid coverage was low.

Amathole District:

Amathole District is situated in the central part of the Eastern Cape, and comprises four sub-districts; Mbhashe, Mnquma, Amahlathi and Nkonkobe. The district fell within the lowest SEQ 1, and was ranked as the fifth most-deprived district in the country. The estimated medical scheme coverage was 8.7%. [64]

There were 11 district hospitals (1.23 per 100 000), with 1 150 public hospital beds (128.79 per 100 000), 144 surgical beds (16.13 per 100 000) and eight public operating theatres (0.90 per 100 000). The number of public hospitals have decreased since 2007, when there were 14 district and two regional hospitals. There were no specialist general surgeons and 15 non-specialist surgeons (1.68 per 100 000) working in the public sector. Amathole district had no private hospitals.

Chris Hani District:

Chris Hani District is situated in the central part of the Eastern Cape and comprises eight sub-districts; Inxuba Yethemba, Lukhanji, Intsika Yethu, Emalahleni, Engcobo, Tsolwana, Inknanca and Sakhisizwe. The district fell into SEQ 1, making it amongst the poorest districts, and had an estimated medical scheme coverage of 5.9%. [64] There were 15 district hospitals (1.87 per 100 000) with 1 476 public sector hospital beds (183.78 per 100 000), 296 surgical beds (36.86 per 100 000) and 19 public sector operating theatres (2.36 per 100 000). There were no specialist general surgeons (in the public sector) and 33 non-specialist general surgeons (4.11 per 100 000) for a population of 803 142 people. There was one private hospital in Queenstown (0.12 per 100 000), with 70 hospital beds (8.72 per 100 000), 15 surgical beds (0.12 per 100 000) and one operating theatre (0.12 per 100 000).

Cacadu District:

Cacadu District is situated on the east coast of the province and borders on the Western Cape. It comprises three sub-districts; Camdeboo, Kouga and Makana. The district had an estimated medical aid coverage of 14.6%, and fell into SEQ 3. [64]

There were ten district hospitals (2.19 per 100 000) with 603 hospital beds (131.95 per 100 000), 65 surgical beds (14.22 per 100 000) and six operating theatres (1.31 per 100 000). There were three private hospitals (0.66 per 100 000), with 95 hospital beds (20.79 per 100 000).

This was an improvement from 2007, when there were no private facilities in the district. There was one specialist general surgeon (0.22 per 100 000) and 23 non-specialist general surgeons (5.03 per 100 000) working in the public sector. There were 25 private surgical beds (5.47 per 100 000) and three operating theatres (0.66 per 100 000).

Joe Gqabi District:

Joe Gqabi District (formally known as Ukhahlamba) is located in the northern part of the Eastern Cape, bordering the Free State and the country of Lesotho to the north. It consists of three sub-districts; Elundini, Maletswai and Senqu. The district had an estimated medical scheme coverage of 5.0%, fell into SEQ 1 and was amongst the poorest districts. [64] There were 11 district hospitals (3.12 per 100 000), which was an improvement from 2007, when there were only eight district hospitals. There were 537 public hospital beds (152.14 per 100 000), 53 public surgical beds (15.02 per 100 000) and eight public operating theatres (2.27 per 100 000). There were no specialist general surgeons and eight non-specialist general surgeons (2.27 per 100 000) working in the public sector. There were no private hospitals in the Joe Gqabi district.

Nelson Mandela Bay District:

Nelson Mandela Bay is a major seaport and automotive manufacturing centre located in the Eastern Cape, and is one of eight metropolitan areas in South Africa. The district had an estimated medical aid coverage of 29.4% and fell into SEQ 5, which was amongst the wealthiest districts. [64]

There was one district hospital and three central or provincial tertiary hospitals (0.34 per 100 000). In 2007, there were three regional hospitals and no central hospitals. There were 428 public hospital beds (36.45 per 100 000) and 25 public sector operating theatres (2.13 per 100 000). There were 11 specialist general surgeons (0.94 per 100 000) and 24 non-specialist general surgeons (2.04 per 100 000) for just over one million people.

There were seven private hospitals in 2007, and the number has fallen to four hospitals (0.34 per 100 000). There were 878 private sector hospital beds (74.77 per 100 000) and 374 private sector surgical beds (31.85 per 100 000). There were 38 private sector operating theatres (3.24 per 100 000), which was the highest in the province.

OR Tambo District:

OR Tambo District is the most populous of the eight district municipalities in the Eastern Cape. The district includes about 80% of what used to be marginalised homeland in Transkei and is formed by five sub-districts; King Sabata Dalindyebo, Nyandeni, Mhlontlo, Port St Johns and Ingquza Hill. The municipality is located to the east of the EC, on the Indian Ocean coastline. The district fell into SEQ 1, and had an estimated medical aid coverage of 4.6%. OR Tambo was one of the 11 National Health Insurance (NHI) pilot districts. [64] There were 12 district hospitals, one regional hospital and two central hospitals (1.10 per 100 000), with 2 698 hospital beds (198.54 per 100 000), 435 surgical beds (32.01 per 100 000) and 31 public sector operating theatres (2.28 per 100 000). There were six specialist general surgeons (0.44 per 100 000) and 52 non-specialist general surgeons (3.82 per 100 000) working in the public sector, for approximately 1.3 million people. There were five private hospitals (0.37 per 100 000), with 610 private hospital beds (44.89 per 100 000), 213 surgical beds (15.67 per 100 000) and 18 private operating theatres (1.32 per 100 000) in the OR Tambo district.

Tables 35 and 36 demonstrate the total number of surgical resources, and the surgical resources per 100 000 in the Eastern Cape.

Table 35: Eastern Cape surgical resource numbers by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Alfred Nzo	3	1	488	31	94	10	0	5	4	0
Amathole	11	0	1 150	0	144	0	0	15	8	0
Buffalo City	6	0	2 074	0	375	0	11	30	17	0
C Hani	15	1	1 476	70	296	15	0	33	19	1
Cacadu	10	3	603	97	65	25	1	23	6	3
Joe Gqabi	11	0	537	0	53	0	0	8	8	0
N Mandela	4	4	1 807	878	428	374	11	24	25	38
O Tambo	15	5	2 698	610	435	213	6	52	31	18

Table 36: Eastern Cape surgical resources per 100 000 population, by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Alfred Nzo	0.37	0.12	59.39	3.77	11.44	1.22	0	0.61	0.49	0
Amathole	1.23	0	128.79	0	16.13	0	0	1.68	0.90	0
Buffalo City	0.79	0	275.35	0	49.79	0	1.46	3.98	2.26	0
C Hani	1.87	0.12	183.78	8.72	36.86	0.12	0	4.11	2.36	0.12
Cacadu	2.19	0.66	131.95	20.79	14.22	5.47	0.22	5.03	1.31	0.66
Joe Gqabi	3.12	0	152.14	0	15.02	0	0	2.27	2.27	0
N Mandela	0.34	0.34	153.89	74.77	36.45	31.85	0.94	2.04	2.13	3.24
O Tambo	1.10	0.37	198.54	44.89	32.01	15.67	0.44	3.82	2.28	1.32

5.2 Resources in the public sector

The Eastern Cape had a total of 75 public hospitals distributed across the eight district municipalities. There was an estimated 10 833 total hospital beds, 1 890 surgical beds and 118 operating theatres in the public sector. There were 53 registered specialist general surgeons, of which 29 (54.7%) were working in public hospitals. There were 190 non-specialist surgeons performing common general surgical procedures in the Eastern Cape. Table 37 demonstrates all public hospital data for each hospital by district. _ (Appendix G).

5.2.1 Hospitals and total beds in the public sector

The largest number of hospitals were found in OR Tambo and Chris Hani district municipalities. The largest number of hospitals per capita were located in Joe Gqabi (3.12 per 100 000). The largest absolute number of hospital beds were located in OR Tambo (n=2 698), Buffalo City (n=2 074) and Nelson Mandela Bay (n=1 807). (Table 38).

Buffalo City had the largest number of hospital beds per population with 275.35 public sector hospital beds per 100 000. Alfred Nzo district municipality had the fewest public hospital beds with 59.39 per 100 000.

Table 38: Eastern Cape public hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Alfred Nzo	821 756	3	0.37	488	59.39
Amathole	892 949	11	1.23	1 150	128.79
Buffalo City	753 213	6	0.79	2 074	275.35
C Hani	803 142	15	1.87	1 476	183.78
Cacadu	456 997	10	2.19	603	131.95
Joe Gqabi	352 958	11	3.12	537	152.14
N Mandela	1 174 205	4	0.34	1 807	153.89
O Tambo	1 358 917	15	1.10	2 698	198.54

Table 39 shows current data compared with that of the HST for 2007. There was a decrease in the number of regional facilities from 2007 to 2014 in Amathole, Nelson Mandela Bay and OR Tambo districts. There was an increase in district hospital number from 61 to 66 hospitals, with Joe Gqabi and OR Tambo districts experiencing these increases. There were seven new level three or central hospitals.

This was related to the upgrading of regional facilities in OR Tambo and Nelson Mandela metropoles. (Figure 11) _ (Appendix G). There was a decrease in bed number to around 2 500 beds during the seven year period. (Figure 12) _ (Appendix G).

Table 39: Eastern Cape public hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	District 2007	District 2014	Regional 2007	Regional 2014	Central 2007	Central 2014	Public beds 2007	Public beds 2014
Alfred Nzo	4	3	0	0	0	0	629	488
Amathole	14	11	2	0	0	0	4 243	1 150
Buffalo City	0	4	0	0	0	2	0	2 074
C Hani	14	14	1	1	0	0	1 438	1 476
Cacadu	10	10	0	0	0	0	1 164	603
Joe Gqabi (Ukhahlamba)	8	11	0	0	0	0	575	537
N Mandela	1	1	3	0	0	3	2 092	1 807
O Tambo	10	12	3	1	0	2	3 280	2 698
Total	61	66	9	2	0	7	13 421	10 833

5.2.2 Surgical beds in the public sector

The largest number of surgical beds were situated in OR Tambo and Chris Hani districts, whereas Buffalo City had the largest number per population with 49.79 per 100 000. This was above the provincial average of 37.62 per 100 000 as well as the national average of 41.55 per 100 000. (Table 40).

Table 40: Eastern Cape public hospital surgical beds per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000
Alfred Nzo	821 756	94	11.44
Amathole	892 949	144	16.13
Buffalo City	753 213	375	49.79
C Hani	803 142	296	36.86
Cacadu	456 997	65	14.22
Joe Gqabi	352 958	53	15.02
N Mandela	1 174 205	428	36.45
O Tambo	1 358 917	435	32.01

5.2.3 Number of general surgeons and operating theatres in the public sector

Buffalo City and OR Tambo had the largest number of specialists, who located predominately at the level three hospitals. This resulted in a ratio of 0.43 specialist general surgeons working in the public sector, per 100 000. There were a reasonable number of non-specialist general surgeons, with 50% of district municipalities having greater than the national average (2.80 per 100 000) non-specialist surgeons per 100 000. (Table 41 and Figure 13).

Table 41: Eastern Cape public hospital general surgeons and operating theatres per 100 000 by region.

Region	Population (2014)	Specialist general surgeons	Specialist general surgeons per 100 000	Non-specialist surgeons	Non-specialist surgeons per 100 000	Operating theatres	Operating theatres per 100 000
Alfred Nzo	821 756	0	0	5	0.61	4	0.49
Amathole	892 949	0	0	15	1.68	8	0.90
Buffalo City	753 213	11	1.46	30	3.98	17	2.26
C Hani	803 142	0	0	33	4.11	19	2.36
Cacadu	456 997	1	0.22	23	5.03	6	1.31
Joe Gqabi	352 958	0	0	8	2.27	8	2.27
N Mandela	1 174 205	11	0.94	24	2.04	25	2.13
O Tambo	1 358 917	6	0.44	52	3.82	31	2.28

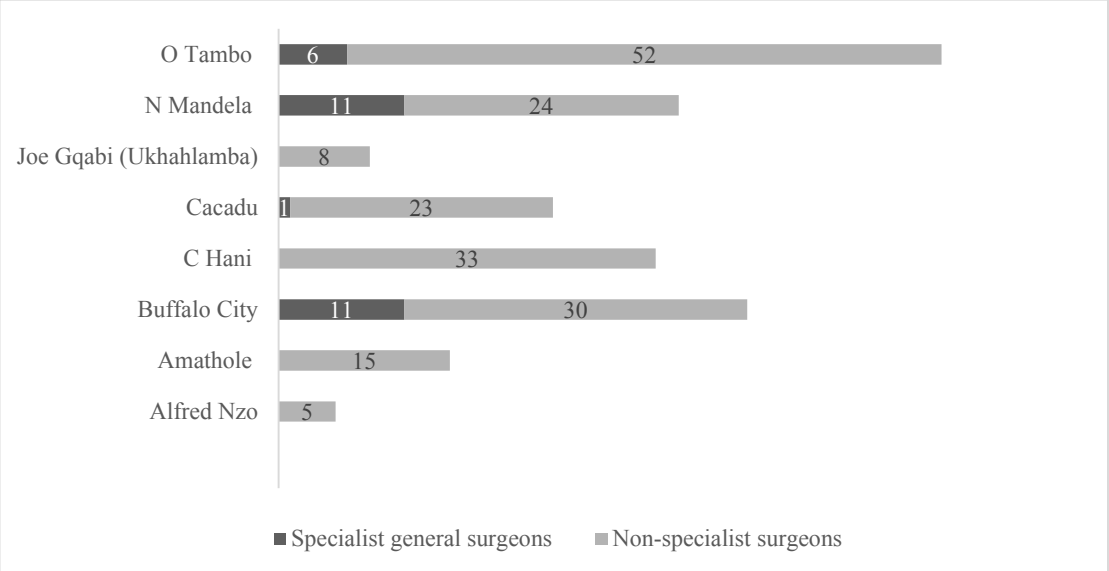


Figure 13: Eastern Cape public specialist and non-specialist surgeons by district.

5.3 Resources in the private sector

There were 13 private hospitals, with 1 684 hospital beds in five of the eight district municipalities. There were 663 surgical beds and 63 operating theatres. (Table 42 _ Appendix G).

5.3.1 Hospitals and total beds in the private sector

Nelson Mandela metropole and OR Tambo had the largest number of private hospitals, although Cacadu had the largest number per population (0.66 per 100 000). (Table 43). Nelson Mandela and OR Tambo had the most beds per population.

Table 43: Eastern Cape private hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Alfred Nzo	821 756	1	0.12	31	3.77
Amathole	892 949	0	0	0	0
Buffalo City	753 213	0	0	0	0
C Hani	803 142	1	0.12	70	8.72
Cacadu	456 997	3	0.66	95	20.79
Joe Gqabi	352 958	0	0	0	0
N Mandela	1 174 205	4	0.34	878	74.77
O Tambo	1 358 917	5	0.37	610	44.89

Comparative data against HST 2007 data showed a slight decrease in the overall hospital number, largely in the Nelson Mandela metropole, despite an increase of 165 private hospital beds, largely in OR Tambo. Table 44. (Figure 14 and 15 _ Appendix G).

Table 44: Eastern Cape private hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	Private hospitals 2007	Private hospitals 2014	Private beds 2007	Private beds 2014
Alfred Nzo	0	1	0	31
Amathole	0	0	0	0
Buffalo City	0	0	0	0
C Hani	1	1	30	70
Cacadu	0	3	0	95
Joe Gqabi	0	0	0	0
N Mandela	7	4	955	878
O Tambo	1	5	110	610
Total	14	13	1 488	1 653

5.3.2 Number of surgical beds and operating theatres in the private sector

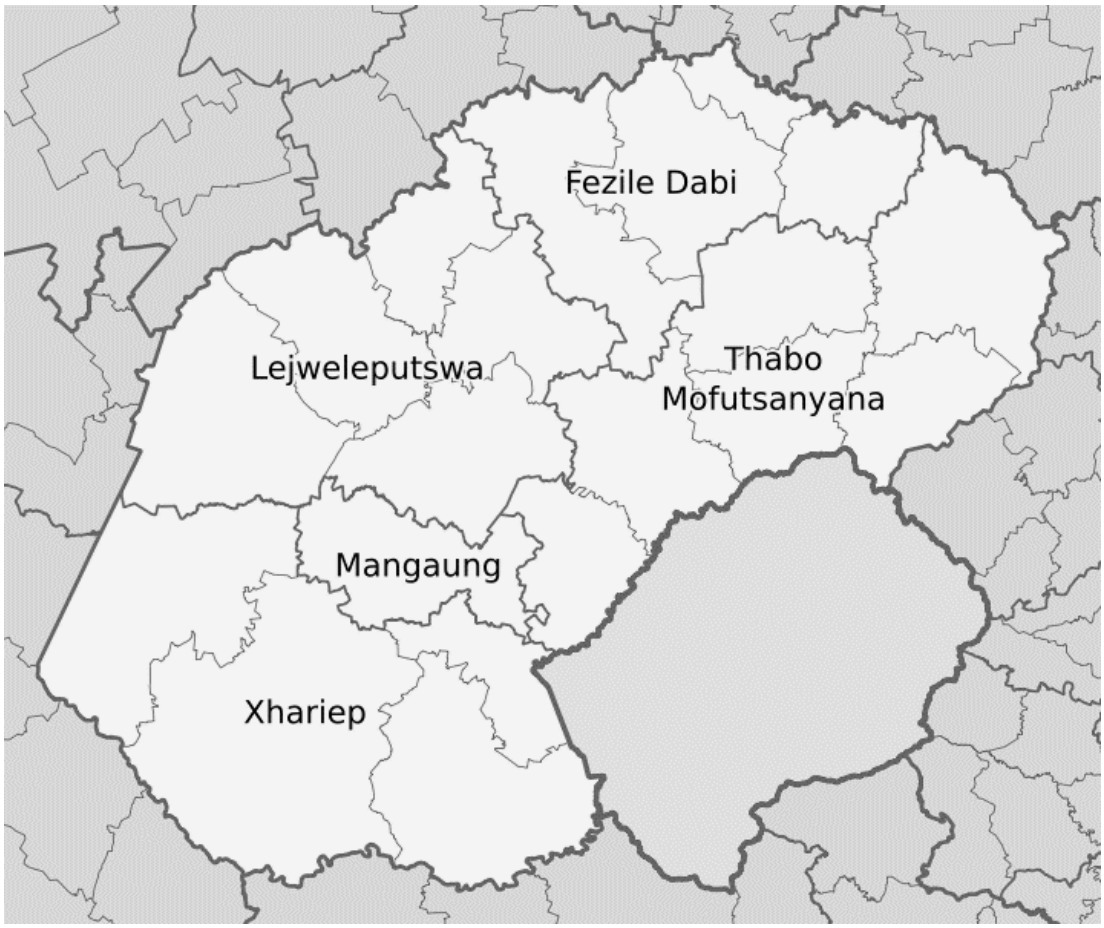
The largest number of private surgical beds and surgical beds per 100 000 were in the Nelson Mandela metropole. There were 38 of the 63 private operating theatres in the Nelson Mandela metropole with 3.24 operating theatres per 100 000. (Table 45).

Table 45: Eastern Cape private hospital surgical beds and operating theatres per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000	Operating theatres	Operating theatres per 100 000
Alfred Nzo	821 756	10	1.22	0	0
Amathole	892 949	0	0	0	0
Buffalo City	753 213	0	0	0	0
C Hani	803 142	15	0.12	1	0.12
Cacadu	456 997	25	5.47	3	0.66
Joe Gqabi	352 958	0	0	0	0
N Mandela	1 174 205	374	31.85	38	3.24
O Tambo	1 358 917	213	15.67	18	1.32

6.1 Free State Provincial Results

The Free State, with almost three million people contains 5.2% of the South African population. The province was not considered a poor one, as all but one of its districts were in the third and fourth highest SEQ. The medical aid coverage for the province was 18.0%. [64]



Map 19: District Municipality map of the Free State. [5]

Fezile Dabi District:

Fezile Dabi District is located in the northern Free State and is divided into four sub-districts; Moqhaka, Metsimaholo, Ngwathe and Mafube. The district fell in the SEQ 4 and had an estimated medical aid coverage of 23.7%, which was the highest in the province. [64]

There were four district hospitals and one regional hospital (0.99 per 100 000), with 596 public hospital beds (117.76 per 100 000), 100 surgical beds (19.76 per 100 000) and ten operating theatres (1.98 per 100 000). There were two specialist general surgeons (0.40 per 100 000) and 19 non-specialist general surgeons (3.75 per 100 000) working in the public sector, for half a million people. There were four private hospitals (140 per 100 000), with 137 private hospital beds (27.07 per 100 000), 40 surgical beds (7.90 per 100 000) and six operating theatres (1.19 per 100 000).

Lejweleputswa District:

Lejweleputswa District is located in the north-western part of the Free State. The district is divided into five sub-districts; Masilonyana, Tokologo, Tswelopele, Matjhabeng and Nala. The district fell in the SEQ 4, which was amongst the wealthier districts, and had an estimated medical aid coverage of 18.1%. [64] There were five district hospitals and one regional hospitals (0.98 per 100 000) in Lejweleputswa. There were 680 public hospital beds (111.44 per 100 000), 125 surgical beds (20.49 per 100 000) and nine operating theatres (1.98 per 100 000). There was one specialist general surgeon (0.16 per 100 000) and 17 non-specialist general surgeons (2.79 per 100 000) working in the public sector. There were four private hospitals (0.66 per 100 000), with 1 167 hospital beds (191.25 per 100 000), 353 surgical beds (57.85 per 100 000) and 17 operating theatres (2.79 per 100 000).

Mangaung District:

Mangaung Metropolitan District is located in the central interior of the Free State Province and comprises three sub-districts, namely Bloemfontein, Botshabelo and Thaba N'chu. The district fell in the SEQ 5, which was amongst the wealthiest districts, and had an estimated medical aid coverage of 27.1%. [64] There were four district hospitals, one regional hospital and one central hospital (0.78 per 100 000). There were 1 460 public sector hospital beds (189.20 per 100 000), 235 surgical beds (30.45 per 100 000) and 31 operating theatres (4.02 per 100 000). There were 10 specialist general surgeons (1.30 per 100 00) and 37 non-specialist general surgeons (4.80 per 100 00) working in the public sector, for 771 645 people. There were six private hospitals (0.78 per 100 000), with 910 private sector hospital beds (117.93 per 100 000), 327 surgical beds (42.38 per 100 000) and 33 operating theatres (4.28 per 100 000).

Thabo Mofutsanyana District:

Thabo Mofutsanyana District is located in the eastern Free State and borders Lesotho and KwaZulu-Natal. The district is divided into six sub-districts; Setsoto, Dihlabeng, Nketoana, Maluti-a-Phofung, Phumelela and Mantsopa. The district fell in the SEQ 3 and had an estimated medical aid coverage of 6.1%. Thabo Mofutsanyana is an NHI pilot district. [64] There were eight district hospitals and two regional hospitals (1.38 per 100 000), with 907 public sector hospital beds (125.40 per 100 000). There were 159 public sector surgical beds (21.98 per 100 000) and 14 operating theatres (1.94 per 100 000). The district had one specialist general surgeon (0.14 per 100 000) and 17 non-specialist general surgeons (2.35 per 100 000) working in the public sector, for 723 307 people. There were two private hospitals (0.28 per 100 000), with 111 private hospital beds (15.35 per 100 000), 44 surgical beds (6.08 per 100 000) and four operating theatres (0.55 per 100 000).

Xhariep District:

Xhariep is the southernmost district in the Free State, and is divided into four sub-districts; Letsemeng, Kopanong, Mohokare and Naledi. The district fell in the SEQ 3 and had an estimated medical aid coverage of 9.7%. [64] There were three district level hospitals (2.11 per 100 000), with 74 public hospital beds (52.15 per 100 000), and one operating theatre (0.70 per 100 000). There were no specifically allocated surgical beds or private hospitals for the 141 892 inhabitants.

Tables 46 and 47 demonstrate the total number of surgical resources, and the surgical resources per 100 000 in the Free State.

Table 46: Free State surgical resource numbers by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospitals beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Fezile Dabi	5	4	596	137	100	40	2	19	10	6
Lejweleputswa	6	4	680	1167	125	353	1	17	9	17
Mangaung	6	6	1460	910	235	327	10	37	31	33
T Mofutsanyane	10	2	907	111	159	44	1	17	14	4
Xhariep	3	0	74	0	0	0	0	0	1	0

Table 47: Free State surgical resources per capita (per 100 000 population), by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Fezile Dabi	0.99	0.79	117.76	22.07	19.76	7.90	0.40	3.75	1.98	1.19
Lejweleputswa	0.98	0.66	111.44	191.25	20.49	57.85	0.16	2.79	1.48	2.79
Mangaung	0.78	0.78	189.20	117.93	30.45	42.38	1.30	4.80	4.02	4.28
T Mofutsanyane	1.38	0.28	125.40	15.35	21.98	6.08	0.14	2.35	1.94	0.55
Xhariep	2.11	0	52.15	0	0	0	0	0	0.70	0

6.2 Resources in the public sector

The Free State had a total of 30 public hospitals distributed across the five district municipalities. There were 3 717 total hospital beds, 619 surgical beds and 65 operating theatres in the public sector. There were 60 registered specialist general surgeons, of which 14 (23%) worked in public hospitals. There were 90 non-specialist surgeons performing common general surgical procedures in the Free State. Table 48 demonstrates all public hospital data for each hospital by district. _ (Appendix H).

6.2.1 Hospitals and total beds in the public sector

The population data was obtained from the HST as well as Stats SA. [60, 64] Although Xhariep was one of the smallest district municipalities in the province and had only three public hospitals, it had the largest number of hospitals per population (1.38 per 100 000). Mangaung had the lowest number of hospitals per population (0.78 per 100 000). (Table 49). Mangaung had the largest total hospital bed number (n=1 460) and beds per population (189.20 per 100 000). Xhariep with only district level hospitals had 74 beds in total and 52.15 beds per 100 000, which was one of the lowest public beds per population ratios in the country.

Table 49: Free State public hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Fezile Dabi	506 109	5	0.99	596	117.76
Lejweleputswa	610 189	6	0.98	680	111.44
Mangaung	771 645	6	0.78	1 460	189.20
T Mofutsanyane	723 307	10	1.38	907	125.40
Xhariep	141 892	3	2.11	74	52.15

Table 50 shows comparative data between 2007 HST and 2014. There was a decrease in the number of regional facilities from 2007 to 2014 in Mangaung, with an increase in the district hospital number. This could have been due to the downgrading of one of the facilities. There was a decrease in bed number of around 600 beds during the seven year period.

Figure 16 demonstrates the comparative between public hospital numbers for the five districts for each hospital level, and Figure 17 demonstrates the comparative between hospital bed numbers for each district _ (Appendix H).

Table 50: Free State public hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	District 2007	District 2014	Regional 2007	Regional 2014	Central 2007	Central 2014	Public beds 2007	Public beds 2014
Fezile Dabi	4	4	1	1	0	0	543	596
Lejweleputswa	5	5	1	1	0	0	751	680
Mangaung	3	4	2	1	1	1	2 117	1 460
T Mofutsanyane	8	8	2	2	0	0	867	907
Xhariep	1	3	0	0	0	0	80	74
Total	21	24	6	5	1	1	4 358	3 717

6.2.2 Surgical beds in the public sector

Mangaung had the largest number of surgical beds (n=235), as well as largest number per population (30.45 per 100 000). (Table 51). Xhariep had no specific beds allocated to surgical patients as the district level facilities were small and were usually only comprised of a male and female ward with patients who had a mixture of pathologies.

Table 51: Free State public hospital surgical beds per 100 000, by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000
Fezile Dabi	506 109	100	19.76
Lejweleputswa	610 189	125	20.49
Mangaung	771 645	235	30.45
T Mofutsanyane	723 307	159	21.98
Xhariep	141 892	0	0

6.2.3 Number of general surgeons and operating theatres in the public sector

Mangaung had the largest number of specialists located at the Universitas Hospital. This resulted in a ratio of 1.30 specialist general surgeons, per 100 000. There were a reasonable number of non-specialist general surgeons in almost all of the districts. (Table 52).

Table 52: Free State public hospital general surgeons and operating theatres per 100 000 by region.

Region	Population (2014)	Specialist general surgeons	Specialist general surgeons per 100 000	Non-specialist surgeons	Non-specialist surgeons per 100 000	Operating theatres	Operating theatres per 100 000
Fezile Dabi	506 109	2	0.40	19	3.75	10	1.98
Lejweleputswa	610 189	1	0.16	17	2.79	9	1.48
Mangaung	771 645	10	1.30	37	4.80	31	4.02
T Mofutsanyane	723 307	1	0.14	17	2.35	14	1.94
Xhariep	141 892	0	0	0	0	1	0.70

There were 4.02 theatres per 100 000 in Mangaung, with 17 of the 31 operating theatres being located at the central hospital. The fewest were found in Xhariep, with only one functional operating theatre in the public sector. Figure 18 demonstrates the general surgeon number per district _ (Appendix H).

6.3 Resources in the private sector

There were 16 private hospitals, with 2 325 usable hospital beds in four of the five district municipalities. There were 764 surgical beds and 60 functional operating theatres. (Table 53_ Appendix H).

6.3.1 Hospitals and total beds in the private sector

Mangaung and Fezile Dabi had the largest number of private hospitals per capita, although the latter also had the fewest private beds per population (27.07 per 100 000). Xhariep had no private hospitals or beds. (Table 54). Lejweleputswa had the most beds per population (191.25 per 100 000).

Table 54: Free State private hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Fezile Dabi	506 109	4	0.79	137	27.07
Lejweleputswa	610 189	4	0.66	1 167	191.25
Mangaung	771 645	6	0.78	910	117.93
T Mofutsanyane	723 307	2	0.28	111	15.35
Xhariep	141 892	0	0	0	0

Comparative data showed a slight decrease in the overall hospital number but an increase of over 300 in the number of hospital beds, largely in Lejweleputswa. Table 55. (Figure 19 and 20 _ Appendix H).

Table 55: Free State private hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	Private hospitals 2007	Private hospitals 2014	Private beds 2007	Private beds 2014
Fezile Dabi	3	4	140	137
Lejweleputswa	3	4	979	1 167
Mangaung	9	6	826	910
T Mofutsanyane	2	2	149	111
Xhariep	0	0	0	0
Total	17	16	2 094	2 325

6.3.2 Number of surgical beds and operating theatres in the private sector

The largest number of surgical beds and surgical beds per 100 000 were in Lejweleputswa. Mangaung had 4.28 operating theatres per 100 000, which was more than any other district. (Table 56).

Table 56: Free State private hospital surgical beds and operating theatres per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000	Operating theatres	Operating theatres per 100 000
Fezile Dabi	506 109	40	7.90	6	1.19
Lejweleputswa	610 189	353	57.85	17	2.79
Mangaung	771 645	327	42.38	33	4.28
T Mofutsanyane	723 307	44	6.08	4	0.55
Xhariep	141 892	0	0	0	0

7.1 Gauteng Provincial Results

Gauteng is the most densely populated province and contains 23.9% of the total population of South Africa, with over 12 million people. It was socio-economically strong and had one of lowest poverty rates of all the provinces as well as having the highest percentage of the population with access to a medical aid (26.6%). [64]

Map 20: District Municipality map of Gauteng. [6]

Johannesburg Metro:

Johannesburg Metro is located in the centre of Gauteng, and is the most populous city in South Africa. The district had an estimated medical aid coverage of 24.8% and fell into SEQ 5. [64] There was one district hospital, three regional hospitals, and two central hospitals (0.13 per 100 000), which had remained unchanged since 2007. There were 5 096 public sector hospital beds (109.75 per 100 000), 832 public sector surgical beds (17.92 per 100 000) and 83 operating theatres (1.78 per 100 000). There were 97 specialist general surgeons (2.09 per 100 000) and 173 non-specialist general surgeons (3.72 per 100 000) working in the public sector, which was the highest number of any district in South Africa. There were 29 private hospitals (0.62 per 100 000), with 5 720 private hospital beds (123.19 per 100 000), 1 841 surgical beds (39.65 per 100 000) and 182 operating theatres (3.92 per 100 000). Despite having the largest number of private surgical resources in the country, there was a decrease in private hospital number, from 38 to 29, between 2007 and 2014.

Tshwane Metro:

Tshwane Metro is situated in the northern part of Gauteng. It merged with Metsweding, as a consequence of implementing the Gauteng Global City Region Strategy, which aimed to reduce the number of municipalities in Gauteng to at least four by 2016. [64] The new City of Tshwane is now the single largest metropolitan municipality in the country. The district fell into the 5th SEQ, and had an estimated medical aid coverage of 33.2% (the highest in the country). Tshwane is one of the 11 NHI pilot districts. [64] There were five district hospitals, one regional hospital and two central hospitals (0.13 per 100 000), with 5 096 public sector hospital beds (109.75 per 100 000), 846 public sector surgical beds (27.38 per 100 000) and 64 public sector operating theatres (2.07 per 100 000). There were 51 specialist general surgeons (1.65 per 100 000), and 100 non-specialist general surgeons (3.23 per 100 000) working in the public sector, for a population of over three million.

This was the second highest number of surgeons working in the public sector in the country. There were 23 private hospitals (0.74 per 100 000), which has decreased from 34 hospitals in 2007. There were 3 919 private hospital beds (126.86 per 100 000), 1 270 private surgical beds (41.11 per 100 000), and 159 private operating theatres (5.14 per 100 000).

Ekurhuleni Metro:

Ekurhuleni Metro is situated in eastern part of Gauteng. The district fell into the 5th SEQ, which was among the wealthiest districts, and had an estimated medical aid coverage of 25.5%. [64] There was one district hospital and five regional hospitals (0.19 per 100 000), with 3 212 public hospital beds (99.40 per 100 000), 343 surgical beds (10.62 per 100 000), and 38 public operating theatres (1.17 per 100 000). There were five specialist general surgeons (0.15 per 100 000) and 30 non-specialist general surgeons (0.93 per 100 000) working in the public sector, for a population of 3.2 million. There were 18 private hospitals (0.56 per 100 000), with 2 776 private hospital beds (85.91 per 100 000), 1 045 private surgical beds (32.34 per 100 000) and 97 private theatres (3.00 per 100 000). The hospital number had decreased since 2007 (from 21 private hospitals). Despite this the private hospital bed number had increased from 2 567 to 2776.

Sedibeng District:

Sedibeng District is situated on the southern tip of Gauteng and is located on the border of Free State, North West and Mpumalanga Provinces. The district has three sub-districts; Emfuleni, Lesedi and Midvaal. The district fell into SEQ 5, which was amongst the wealthiest districts, and had an estimated medical aid coverage of 19.4%. [64]

There were two district and one regional hospitals in Sedibeng (0.33 per 100 000), with 1 119 public hospital beds (122.25 per 100 000), 235 surgical beds (25.67 per 100 000) and 15 public operating theatres (1.64 per 100 000). There were two specialist general surgeons (0.22 per 100 000) and 30 non-specialist general surgeons (3.28 per 100 000) working in the public sector, for a population of 915 337. There were seven private hospitals (0.76 per 100 000), with 856 private hospital beds (93.52 per 100 000), 252 surgical beds (27.53 per 100 000), and 26 private operating theatres (2.84 per 100 000).

West Rand District:

West Rand District is located in the west of Gauteng and is bordered by Bojanala Platinum to the north-west, Tshwane to the north-east, Johannesburg to the east, Sedibeng to the south-east and Dr Kenneth Kaunda (North West Province) to the south-west. The district is divided into four sub-districts; Merafong City, Mogale City, Randfontein and Westonaria. The district fell in SEQ 4, which was amongst the wealthier districts, and had an estimated medical aid coverage of 24.4%. [64] There were two district hospitals and one regional hospital in the West Rand (0.35 per 100 000), with 1 288 public sector hospital beds (151.62 per 100 000), 196 public sector surgical beds (22.80 per 100 000) and 11 operating theatres (1.29 per 100 000). There were three specialist general surgeons (0.35 per 100 000) and 16 non-specialist general surgeons (1.88 per 100 000) working in the public sector, for 850 000 people. There were eight private hospitals (0.94 per 100 000), with 1 055 private hospital beds (124.19 per 100 000), 429 surgical beds (50.50 per 100 000) and 36 private operating theatres (4.23 per 100 000).

Tables 57 and 58 demonstrate the total number of surgical resources, and the surgical resources 100 000 in Gauteng.

Table 57: Gauteng surgical resource numbers by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Johannesburg	6	29	5 096	5 720	832	1 841	97	173	83	182
Tshwane	8	23	4 140	3 919	846	1 270	51	100	64	159
Ekurhuleni	6	18	3 212	2 776	343	1 045	5	30	38	97
Sedibeng	3	7	1 119	856	235	252	2	30	15	26
West Rand	3	8	1 288	1 055	196	429	3	16	11	36

Table 58: Gauteng surgical resources per 100 000 population, by district,

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Johannesburg	0.13	0.62	109.75	123.19	17.92	39.65	2.09	3.72	1.78	3.92
Tshwane	0.26	0.74	134	126.86	27.38	41.11	1.65	3.23	2.07	5.14
Ekurhuleni	0.19	0.56	99.40	85.91	10.62	32.34	0.15	0.93	1.17	3.00
Sedibeng	0.33	0.76	122.25	93.52	25.67	27.53	0.22	3.28	1.64	2.84
West Rand	0.35	0.94	151.62	124.19	22.80	50.50	0.35	1.88	1.29	4.23

7.2 Resources in the public sector

Gauteng had 26 public hospitals distributed across the five district municipalities. There were 14 855 usable hospital beds, of which 2 452 are surgical beds and 211 functional operating theatres. There were 158 specialist general surgeons working the in public sector, which comprised 53% of the 298 who were registered in the province. There were 349 non-specialist general surgeons performing general surgeries in the province. Table 59 demonstrates the provincial surgical resource data by district. _ (Appendix I).

7.2.1 Hospitals and total beds in the public sector

The population data was obtained from the HST as well as Stats SA. [60, 64] Johannesburg metropole municipality was one of the most populous in the country and although there were few hospitals (0.13 per 100 000), these were largely regional and central hospitals with upwards of 230 beds each. These included Chris Hani Baragwanath and Charlotte Maxeke hospitals which each had over 1 000 beds. Sedibeng had the most beds per population (151.62 per 100 000) and Ekurhuleni had the least, with 99.40 beds per 100 000. Table 60.

Table 60: Gauteng public hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Johannesburg	4 643 130	6	0.13	5 096	109.75
Tshwane	3 089 315	8	0.26	4 140	134.00
Ekurhuleni	3 231 178	6	0.19	3 212	99.40
Sedibeng	915 337	3	0.33	1 119	122.25
West Rand	849 478	3	0.35	1 288	151.62

Table 61 and Figure 21 show current data compared with that of the HST for 2014. There was an increase in the number of regional and central facilities, but an overall decrease of about 500 beds between 2007 and 2014. Figure 22 demonstrates current data (public hospital bed number) compared with that of 2007 HST data. _ (Appendix I).

Table 61: Gauteng public hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	District 2007	District 2014	Regional 2007	Regional 2014	Central 2007	Central 2014	Public beds 2007	Public beds 2014
Johannesburg	1	1	3	3	2	2	5 163	5 096
Tshwane	3	5	2	1	0	2	4 637	4 140
Ekurhuleni	1	1	5	5	0	0	2 817	3 212
Sedibeng	2	2	1	1	0	0	1 086	1 119
West Rand	2	2	1	1	0	0	1 605	1 288
Total	9	11	12	11	2	4	15 308	14 855

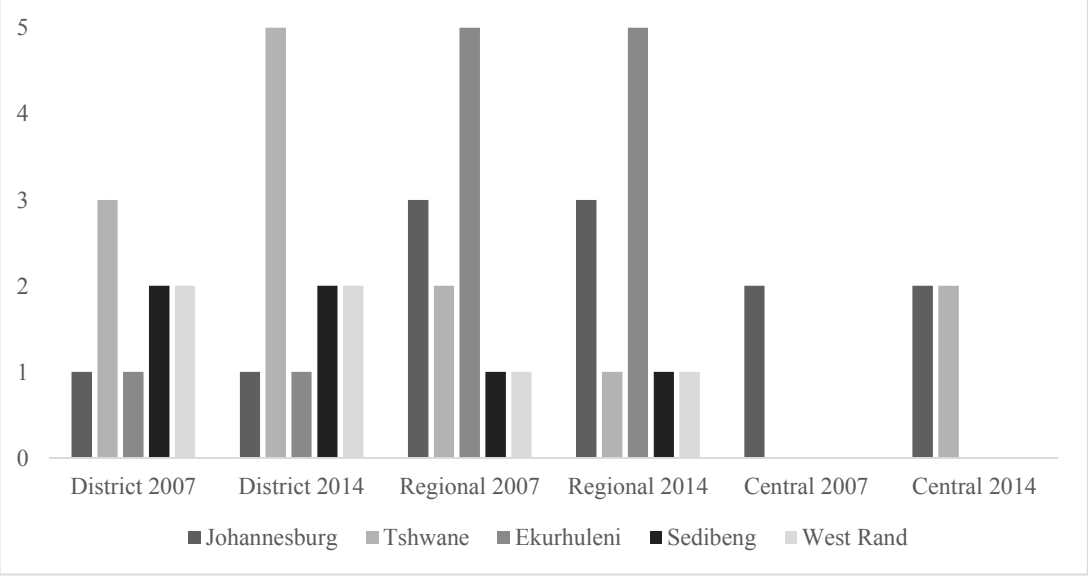


Figure 21: Comparative between Gauteng public hospital number for 2007 and 2014.

7.2.2 Surgical beds in the public sector

Tshwane had the largest absolute number of surgical beds (n=846) as well as largest number per population (27.38 per 100 000). (Table 62). The West Rand had the fewest absolute surgical bed number (n=196) and Ekurhuleni had the fewest surgical beds per population (10.62 per 100 000). Gauteng province had the most surgical beds per population (56.44 per 100 000), but only after the large number of private surgical beds were factored in.

Table 62: Gauteng public hospital surgical beds per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000
Johannesburg	4 643 130	832	17.92
Tshwane	3 089 315	846	27.38
Ekurhuleni	3 231 178	343	10.62
Sedibeng	915 337	235	25.67
West Rand	849 478	196	22.80

7.2.3 Number of general surgeons and operating theatres in the public sector

Johannesburg had the largest number of specialist general surgeons located at the two central hospitals (97 and 2.09 per 100 000), followed by Tshwane which had another two central hospitals (51 and 1.65 per 100 000). There were a large number of non-specialist general surgeons in these two district municipalities. The fewest non-specialist general surgeons per population were in Ekurhuleni (0.93 per 100 000). Table 63. (Figure 23 _ Appendix I).

Table 63: Gauteng public hospital general surgeons and operating theatres per 100 000 by region.

Region	Population (2014)	Specialist general surgeons	Specialist general surgeons per 100 000	Non-specialist surgeons	Non-specialist surgeons per 100 000	Operating theatres	Operating theatres per 100 000
Johannesburg	4 643 130	97	2.09	173	3.72	83	1.78
Tshwane	3 089 315	51	1.65	100	3.23	64	2.07
Ekurhuleni	3 231 178	5	0.15	30	0.93	38	1.17
Sedibeng	915 337	2	0.22	30	3.28	15	1.64
West Rand	849 478	3	0.35	16	1.88	11	1.29

There are 2.07 operating theatres per 100 000 in Tshwane. Johannesburg had a higher total number of operating theatres (n=83) but translated into 1.78 per 100 000. Ekurhuleni had the fewest functional operating theatres per population (1.17 per 100 000). (Table 63).

7.3 Resources in the private sector

There were 85 private hospitals in Gauteng, with a total of 14 326 usable hospital beds in the five district and metropole municipalities. There were 4 837 private surgical beds and 500 functional operating theatres. (Table 64 _ Appendix I).

7.3.1 Hospitals and total beds in the private sector

Johannesburg and Tshwane had the largest number of private hospitals. However, because of the smaller populations in West Rand and Sedibeng, these districts had the largest number per 100 000. Johannesburg, Tshwane and the West Rand had a similar number of total beds per 100 000.

Table 65: Gauteng private hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Johannesburg	4 643 130	29	0.62	5 720	123.19
Tshwane	3 089 315	23	0.74	3 919	126.86
Ekurhuleni	3 231 178	18	0.56	2 776	85.91
Sedibeng	915 337	7	0.76	856	93.52
West Rand	849 478	8	0.94	1 055	124.19

Comparative data showed a decrease in the overall hospital number and a marginal increase of about 150 private hospital beds, largely in Johannesburg and Sedibeng. Metsweding became part of Tshwane in 2011. Table 66. (Figure 24 and 25 _ Appendix I).

Table 66: Gauteng private hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	Private hospitals 2007	Private hospitals 2014	Private beds 2007	Private beds 2014
Johannesburg	38	29	5 166	5 720
Tshwane	34	23	4 232	3 919
Ekurhuleni	21	18	2 567	2 776
Metsweding	1	0	43	0
Sedibeng	8	7	616	856
West Rand	13	8	1 533	1 055
Total	115	85	14 157	14 326

7.3.2 Number of surgical beds and operating theatres in the private sector

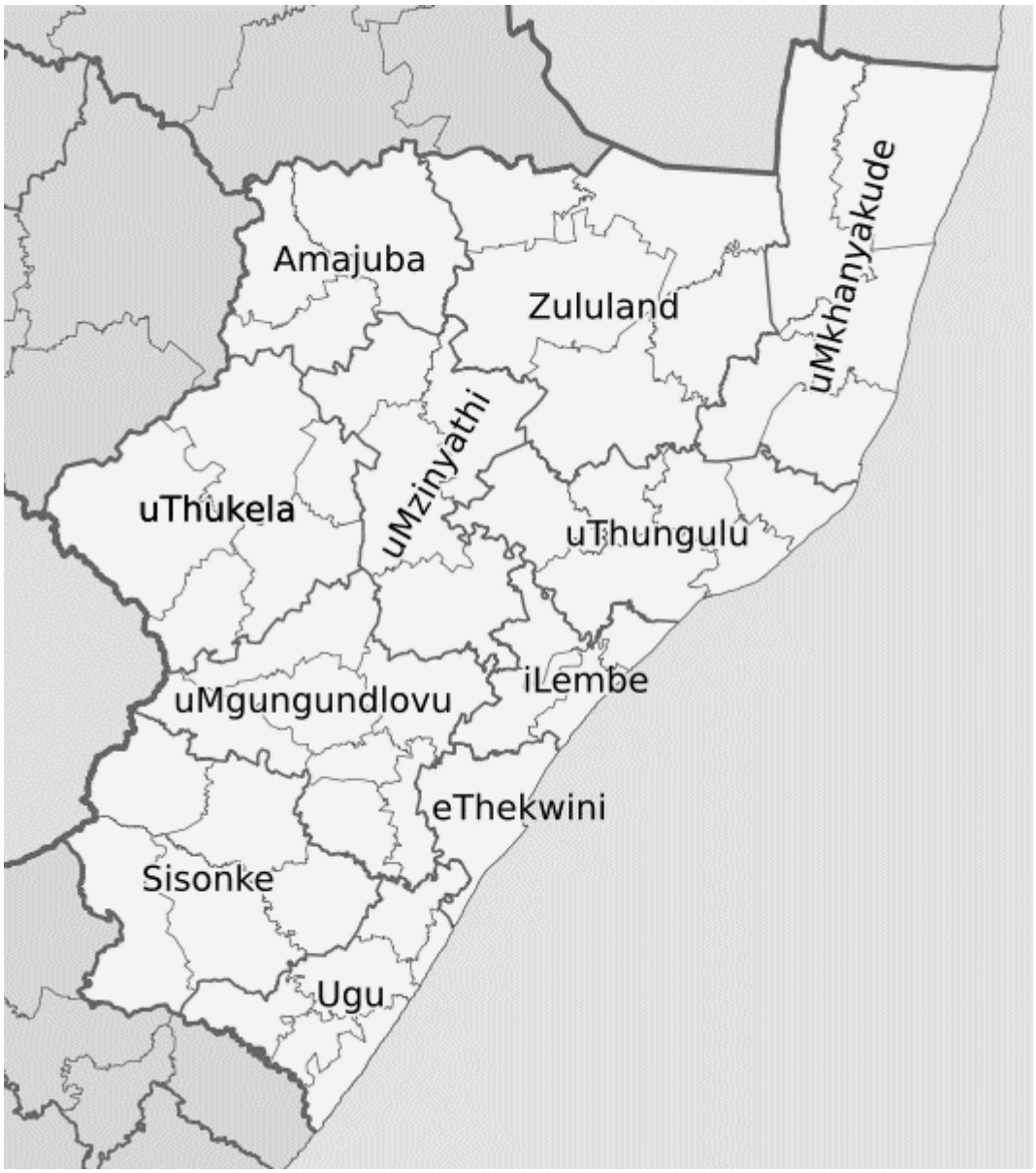
The largest number of surgical beds were in Johannesburg. However, the largest number per population were in the West Rand (50.50 per 100 000). Tshwane had 5.14 operating theatres per 100 000, and all Gauteng districts had adequate numbers of functional private operating theatres per 100 000. However, only 16% of the population can access these theatres making this falsely reassuring. (Table 67).

Table 67: Gauteng private hospital surgical beds and operating theatres per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000	Operating theatres	Operating theatres per 100 000
Johannesburg	4 643 130	1 841	39.65	182	3.92
Tshwane	3 089 315	1 270	41.11	159	5.14
Ekurhuleni	3 231 178	1 045	32.34	97	3.00
Sedibeng	915 337	252	27.53	26	2.84
West Rand	849 478	429	50.50	36	4.23

8.1 KwaZulu-Natal Provincial Results

KwaZulu-Natal is one of the poorest provinces. With a population of over 10 million people, it comprises nearly 20% of the total population of South Africa. It is divided into ten districts and medical aid coverage is estimated at 12.5%. [64]



Map 21: District Municipality map of KwaZulu-Natal. [7]

Amajuba District:

Amajuba District is located in the north-western corner of KwaZulu-Natal and comprises three sub-districts; Dannhauser, Emadlangeni and Newcastle. The district fell in the SEQ 3 and had an estimated medical aid coverage of 9.4%. There was one district and two regional hospitals (0.59 per 100 000), with 1 146 public sector hospital beds (225.83 per 100 000), 168 surgical beds (33.11 per 100 000) and ten public sector operating theatres (1.97 per 100 000). There were two specialist general surgeons (0.39 per 100 000) and six non-specialist general surgeons (1.18 per 100 000) working in the public sector. There was one private hospital (0.20 per 100 000), with 138 hospital beds (27.19 per 100 000), 36 surgical beds (7.09 per 100 000) and five operating theatres (0.99 per 100 000). Amajuba is one of the 11 NHI pilot districts. [64]

eThekwini Metro:

eThekwini Metro is situated on the south-east coast in KwaZulu-Natal. The district fell in the SEQ 5, which was amongst wealthiest in South Africa, and had an estimated medical aid coverage of 20.5%, which was the highest in the province. [64] There were three district, seven regional, and one central hospital (0.32 per 100 000) for 3.4 million people. There were 5 871 public sector hospital beds (169.48 per 100 000), which was far fewer than in 2007 when there were 9 039 beds. There were 1 156 public sector surgical beds (33.37 per 100 000) and 65 public sector operating theatres (1.88 per 100 000). There were 41 specialist general surgeons (1.18 per 100 000) and 48 non-specialist general surgeons (1.39 per 100 000) working in public hospitals. There were 17 private hospitals (0.49 per 100 000), with 3 104 private sector hospital beds (89.60 per 100 000), 963 surgical beds (27.80 per 100 000), and 109 operating theatres (3.15 per 100 000).

iLembe District:

iLembe District is situated on the east coast of KwaZulu-Natal and is the smallest of the province's districts. It consists of four sub-districts, namely Mandeni, KwaDukuza, Maphumulo and Ndwedwe. The district fell in the SEQ 2, which was amongst the poorer districts, and had an estimated medical aid coverage of 7.3%. [64] There were three district and on regional hospital (0.63 per 100 000), with 882 public sector hospital beds (186.90 per 100 000), 169 public sector surgical beds (26.80 per 100 000) and seven public operating theatres (1.11 per 100 000). There were two specialist general surgeons (0.32 per 100 000) and 11 non-specialist general surgeons (1.74 per 100 000) working in the public sector. There was one private hospital (0.16 per 100 000), with 119 private sector hospital beds (18.87 per 100 000), 25 surgical beds (3.97 per 100 000), and three private operating theatres (0.48 per 100 000). This was an improvement from 2007, when there were no private facilities.

Harry Gwala District:

Harry Gwala District (previously known as Sisonke), is situated in the south of KwaZulu-Natal and comprises five sub-districts, namely Ingwe, Kwa Sani, uMzimkhulu, Greater Kokstad and Ubuhlebezwe. The district fell in the SEQ 1, which was amongst the most deprived districts in South Africa, and had an estimated medical scheme coverage of 6.3%. [64] There were four district hospitals (0.85 per 100 000), with 716 public sector hospital beds (151.73 per 100 000), 154 surgical beds (32.63 per 100 000) and nine operating theatres (1.91 per 100 000). There were no specialist general surgeons and seven non-specialist general surgeons (1.48 per 100 000) working in the public sector. There were two private hospitals (0.42 per 100 000), with 139 private sector hospital beds (29.46 per 100 000), 37 surgical beds (7.84 per 100 000) and four private operating theatres (0.85 per 100 000).

Ugu District:

Ugu District is situated in the southern part of KwaZulu-Natal. The district consists of six sub-districts; Vulamehlo, Umdoni, uMzumbe, Hibiscus Coast, Ezinqoleni and uMuziwabantu. The district fell in the SEQ 2 and had an estimated medical scheme coverage of 7.3%. [64] There were three district and one regional hospital (0.55 per 100 000), with 1 143 public sector hospital beds (155.89 per 100 000), 193 surgical beds (26.32 per 100 000) and ten operating theatres (1.36 per 100 000). There were two specialist general surgeons (0.27 per 100 000) and 19 non-specialist general surgeons (2.59 per 100 000) working in the public sector. There were three private hospitals (0.41 per 100 000), with 388 private sector hospital beds (52.91 per 100 000), 83 surgical beds (11.32 per 100 000) and nine private sector operating theatres (1.23 per 100 000).

uMgungundlovu District:

uMgungundlovu District, one of 11 NHI pilot districts, is situated in the midlands of KwaZulu-Natal and comprises seven local sub-districts, namely Impendle, Mkhambathini, Mooi Mpofana, Msunduzi, Richmond, uMngeni, and uMshwathi. The district that fell in the SEQ 3 and had an estimated medical scheme coverage of 15.7%. [64] There were two district, one regional and one central hospital (0.04 per 100 000) for over one million people. There were 1 975 public sector hospital beds (187.60 per 100 000), 419 public sector surgical beds (39.80 per 100 000), and 35 public sector operating theatres (3.32 per 100 000). There were 17 specialist general surgeons (1.61 per 100 000) and 37 non-specialist general surgeons (3.51 per 100 000) working in public hospitals. There were three private hospitals (0.28 per 100 000), with 344 private sector hospital beds (32.68 per 100 000), 134 surgical beds (12.73 per 100 000), and 16 operating theatres (1.52 per 100 000).

uMkhanyakude District:

uMkhanyakude District is located in the far north of the KwaZulu-Natal and is the second-largest district in the province. It shares its borders with Swaziland and Mozambique, as well as with the districts of Zululand and uThungulu. The district comprises five sub-districts, namely Hlabisa, Jozini, Mtubatuba, The Big 5 False Bay and uMhlabuyalingana. The district fell in the SEQ 1, which was amongst the poorest districts, and had an estimated medical scheme coverage of 3.9%, the lowest in the province. [64] There were five district hospitals (0.78 per 100 000), with 206 public sector hospital beds (189.02 per 100 000), 154 surgical beds (24.14 per 100 000) and ten operating theatres (1.57 per 100 000). There were no specialist surgeons and 31 non-specialist general surgeons (4.86 per 100 000), working in public hospitals. There were no private hospitals in uMkhanyakude District.

uMzinyathi District:

uMzinyathi District is situated in the north central region of KwaZulu-Natal. It consists of four sub-districts; Endumeni, Nquthu, Msinga and uMvoti. The district fell in the SEQ 1, which was amongst the poorest districts, and had an estimated medical scheme coverage of 7.0%. uMzinyathi is also one of the 11 NHI pilot districts. [64] There were four district hospitals (0.78 per 100 000), with 1 032 public sector hospital beds (200.69 per 100 000), 165 surgical beds (32.09 per 100 000) and eight public operating theatres (1.56 per 100 000). There were 32 non-specialist surgeons (6.22 per 100 000) and no private hospitals for a population of 514 217.

uThukela District:

uThukela District is located on the western boundary of KwaZulu-Natal and is bordered by three other districts: Amajuba, uMzinyathi and uMgungundlovu. It consists of five sub-districts; Indaka, Emnambithi/Ladysmith, uMtshezi, Okhahlamba and Imbabazane.

The district fell into SEQ 2, and had an estimated medical scheme coverage of 5.0%. [64] There were two district and one regional hospital (0.44 per 100 000), with 929 public sector hospital beds (136.06 per 100 000), 170 surgical beds (24.90 per 100 000) and nine operating theatres (1.32 per 100 000). There was one specialist general surgeon (0.15 per 100 000) and 14 non-specialist surgeons (2.05 per 100 000) working in the public sector, for 682 797 people. There was one private hospital (0.15 per 100 000), with 105 private sector hospital beds (15.38 per 100 000), 34 surgical beds (4.98 per 100 000) and three private operating theatres (0.44 per 100 000).

uThungulu District:

uThungulu District is situated within the north-eastern area of KwaZulu-Natal. It comprises six sub-districts; uMlalazai, Mthonjaneni, Nkandla, Mbonambi, Ntambanana and uMhlathuze. The district fell in the SEQ 2, and had an estimated medical scheme coverage of 12.5%. [64] There were six district and two regional hospitals (0.85 per 100 000), with 1 938 public sector hospital beds (206.66 per 100 000), 250 surgical beds (26.66 per 100 000) and 17 operating theatres (1.81 per 100 000). There were three specialist general surgeons and three non-specialist general surgeons (0.32 per 100 000) working in the public sector, for just under one million people. There were two private hospitals (0.21 per 100 000), with 437 private sector hospital beds (46.60 per 100 000), 134 surgical beds (14.29 per 100 000), and 12 private operating theatres (1.28 per 100 000).

Zululand District:

Zululand District is situated in the north-eastern part of KwaZulu-Natal. It is primarily a rural district and comprises five sub-districts, namely Nongoma, Ulundi, eDumbe, uPhongolo and Abaqulusi. The district fell in the SEQ 1, which was amongst the poorest districts, and had an estimated medical aid coverage of 6.5%. [64] There were five district hospitals (0.61 per 100 000), with 1 267 public sector hospital beds (153.75 per 100 000), 194 surgical beds (23.54 per 100 000) and seven operating theatres (0.85 per 100 000). There were 23 non-specialist surgeons (2.79 per 100 000) working in the public sector. There was one private hospital (0.12 per 100 000), with 28 beds (3.40 per 100 000), three surgical beds (0.36 per 100 000) and one operating theatre.

Tables 68 and 69 demonstrate the total number of surgical resources, and the surgical resources per 100 000 in KwaZulu-Natal.

Table 68: KwaZulu-Natal surgical resource numbers by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Amajuba	3	1	1 146	138	168	36	2	6	10	5
eThekwini	11	17	5 871	3 104	1 156	963	41	48	65	109
iLembe	4	1	882	119	169	25	2	11	7	3
Harry Gwala	4	2	716	139	154	37	0	7	9	4
Ugu	4	3	1 143	388	193	83	2	19	10	9
uMgungundlovu	4	3	1975	344	419	134	17	37	35	16
uMkhanyakude	5	0	1 206	0	154	0	0	31	10	0
uMzinyathi	4	0	1 032	0	165	0	0	32	8	0
uThukela	3	1	929	105	170	34	1	14	9	3
uThungulu	8	2	1 938	437	250	134	3	3	1	12
Zululand	5	1	1 267	28	194	3	0	23	7	1

Table 69: KwaZulu-Natal surgical resources per 100 000 population, by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Amajuba	0.59	0.20	225.83	27.19	33.11	7.09	0.39	1.18	1.97	0.99
eThekwini	0.32	0.49	169.48	89.60	33.37	27.80	1.18	1.39	1.88	3.15
iLembe	0.63	0.16	186.90	18.87	26.80	3.97	0.32	1.74	1.11	0.48
Harry Gwala	0.85	0.42	151.73	29.46	32.63	7.84	0	1.48	1.91	0.85
Ugu	0.55	0.41	155.89	52.91	26.32	11.32	0.27	2.59	1.36	1.23
uMgungundlovu	0.04	0.28	187.60	32.68	39.80	12.73	1.64	3.51	3.32	1.52
uMkhanyakude	0.78	0	189.02	0	24.14	0	0	4.85	1.57	0
uMzinyathi	0.78	0	200.69	0	32.09	0	0	6.22	1.56	0
uThukela	0.44	0.15	136.06	15.38	24.90	4.98	0.15	2.05	1.32	0.44
uThungulu	0.85	0.21	206.66	46.60	26.66	14.29	0.32	0.32	1.81	1.28
Zululand	0.61	0.12	153.75	3.40	23.44	0.36	0	2.79	0.85	0.12

8.2 Resources in the public sector

The KwaZulu-Natal Province had a total of 55 public hospitals distributed across the 11 district municipalities. There were an estimated 18 087 total hospital beds, 3 192 surgical beds and 183 operating theatres in the public sector. There were 203 registered specialist general surgeons, of which 68 (33.5%) worked in public hospitals. There were an estimated 249 non-specialist doctors performing common general surgical procedures in KZN. Table 70 demonstrates all public hospital data for each hospital by district _ (Appendix J).

8.2.1 Hospitals and total beds in the public sector

The eThekwini district municipality had the largest number of hospitals (n=11), and Harry Gwala and uThungulu had the largest number of hospitals per population (0.85 per 100 000 each). Amajuba had the largest number of hospital beds per population (225.83 per 100 000), and uThukela had the fewest with 136.06 per 100 000. (Table 71).

Table 71: KwaZulu-Natal public hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Amajuba	507 467	3	0.59	1 146	225.83
eThekwini	3 464 205	11	0.32	5 871	169.48
iLembe	630 464	4	0.63	882	186.90
Harry Gwala	471 904	4	0.85	716	151.73
Ugu	733 228	4	0.55	1 143	155.89
uMgungundlovu	1 052 730	4	0.04	1 975	187.60
uMkhanyakude	638 011	5	0.78	1 206	189.02
uMzinyathi	514 217	4	0.78	1 032	200.69
uThukela	682 797	3	0.44	929	136.06
uThungulu	937 793	8	0.85	1 938	206.66
Zululand	824 091	5	0.61	1 267	153.75

When the data was compared with 2007 HST data, there was an increase in the number of district facilities and a decrease in the number of central hospitals in eThekwini. There was a large decrease of over 7 000 beds in the total public hospital bed number, with eThekwini experiencing a reduction of about 4 000 beds. (Table 72, Figure 26 and 27 _ Appendix J).

8.2.2 Surgical beds in the public sector

The eThekwini district municipality had the largest number of inhabitants and had the largest absolute number of surgical beds (n=1 156). The uMgungundlovu district municipality had the largest surgical bed number per population in the public sector with 39.80 per 100 000. (Table 73).

Table 73: KwaZulu-Natal public hospital surgical beds per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000
Amajuba	507 467	168	33.11
eThekwini	3 464 205	1 156	33.37
iLembe	630 464	169	26.80
Harry Gwala	471 904	154	32.63
Ugu	733 228	193	26.32
uMgungundlovu	1 052 730	419	39.80
uMkhanyakude	638 011	154	24.14
uMzinyathi	514 217	165	32.09
uThukela	682 797	170	24.90
uThungulu	937 793	250	26.66
Zululand	824 091	194	23.54

8.2.3 Number of general surgeons and operating theatres in the public sector

The eThekwini and uMgungundlovu district municipalities had the largest number of specialist general surgeons working in public hospitals. Four of the 11 districts had no specialist surgeons but had non-specialist general surgeons who were able to contribute to alleviating the surgical burden, albeit without specialist supervision. Table 74 (Figure 28_ Appendix J).

Table 74: KwaZulu-Natal public hospital general surgeons and operating theatres per 100 000 by region.

Region	Population (2014)	Specialist general surgeons	Specialist general surgeons per 100 000	Non-specialist surgeons	Non-specialist surgeons per 100 000	Operating theatres	Operating theatres per 100 0000
Amajuba	507 467	2	0.39	6	1.18	10	1.97
eThekwini	3 464 205	41	1.18	48	1.39	65	1.88
iLembe	630 464	2	0.32	11	1.74	7	1.11
Harry Gwala	471 904	0	0	7	1.48	9	1.91
Ugu	733 228	2	0.27	19	2.59	10	1.36
uMgungundlovu	1 052 730	17	1.61	37	3.51	35	3.32
uMkhanyakude	638 011	0	0	31	4.86	10	1.57
uMzinyathi	514 217	0	0	32	6.22	8	1.56
uThukela	682 797	1	0.15	14	2.05	9	1.32
uThungulu	937 793	3	0.32	3	0.32	17	1.81
Zululand	824 091	0	0	23	2.79	7	0.85

There were 3.32 theatres per 100 000 in uMgungundlovu, with 35 functional operating theatres. The eThekwini district municipality had the largest absolute number of theatres (n=65), but with the largest number of inhabitants (over three million) in the province, only had 1.88 operating theatres per 100 000. (Table 74).

8.3 Resources in the private sector

There were 32 private hospitals in KwaZulu-Natal with a total of 4 802 usable hospital beds in nine of the 11 district municipalities. There were 1 459 surgical beds and 162 functional operating theatres. (Table 75 _ Appendix J).

8.3.1 Hospitals and total beds in the private sector

The eThekwini district had the largest number of private hospitals per population (0.49 per 100 00), followed by Harry Gwala and Ugu. (Table 76). There was a clear concentration of private hospital beds in the metropolitan areas with 89.60 per 100 000 in eThekwini and none in uMkhanyakude and uMzinyathi.

Table 76: KwaZulu-Natal private hospitals and total hospital beds per capita by region.

Region	Population (2014)	Total hospitals	Total hospitals per capita	Total hospital beds	Total hospital beds per capita
Amajuba	507 467	1	0.20	138	27.19
eThekwini	3 464 205	17	0.49	3 104	89.60
iLembe	630 464	1	0.16	119	18.87
Harry Gwala	471 904	2	0.42	139	29.46
Ugu	733 228	3	0.41	388	52.91
uMgungundlovu	1 052 730	3	0.28	344	32.68
uMkhanyakude	638 011	0	0	0	0
uMzinyathi	514 217	0	0	0	0
uThukela	682 797	1	0.15	105	15.38
uThungulu	937 793	2	0.21	437	46.60
Zululand	824 091	1	0.12	28	3.40

Comparative data between 2007 and 2014 showed a decrease in the private hospital number in the large metropoles, but with an overall increase in the private hospital bed number by over 1 000 beds. There was a new private hospital opened in iLembe in the seven year period, where previously there were none. Table 77. (Figures 29 and 30 _ Appendix J).

Table 77: KwaZulu-Natal private hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	Private hospitals 2007	Private hospitals 2014	Private beds 2007	Private beds 2014
Amajuba	1	1	90	138
eThekwini	20	17	2 625	3 104
iLembe	0	1	0	119
Harry Gwala	2	2	52	139
Ugu	2	3	110	388
uMgungundlovu	6	3	443	344
uMkhanyakude	0	0	0	0
uMzinyathi	0	0	0	0
uThukela	1	1	98	105
uThungulu	3	2	308	437
Zululand	1	1	26	28
Total	36	31	3 752	4 802

8.3.2 Number of surgical beds and operating theatres in the private sector

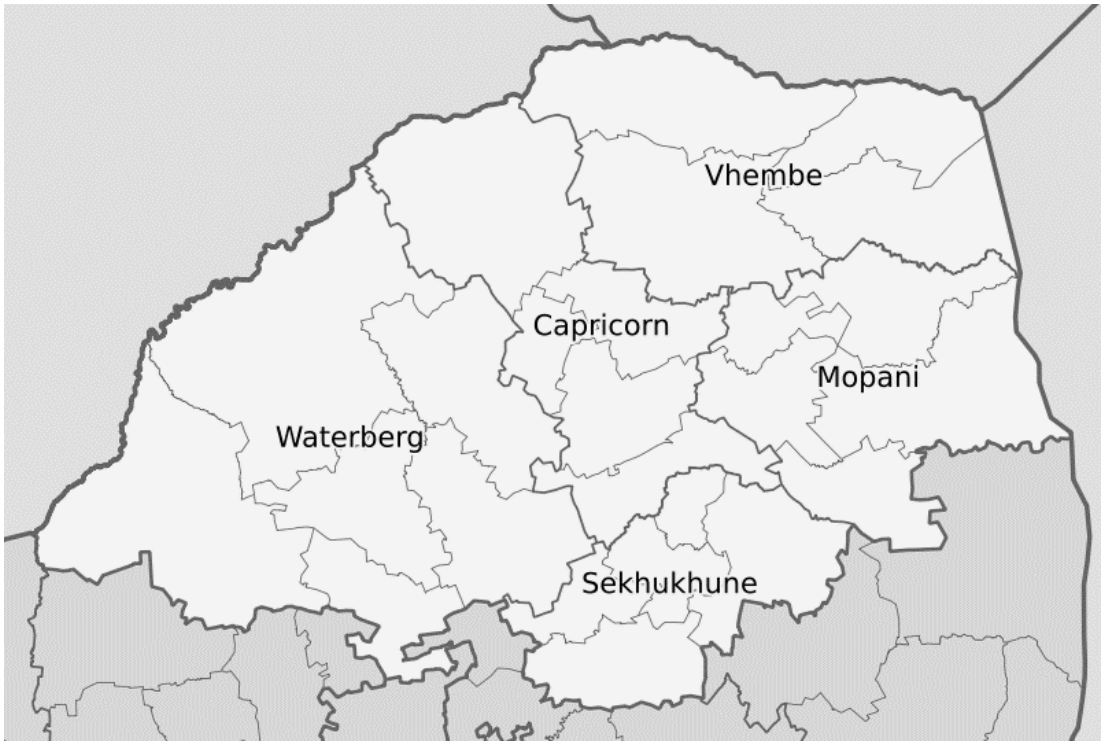
The largest number of surgical beds (n=963) and surgical beds per population (27.80 per 100 000) were in eThekwini. There were 109 private operating theatres and 3.15 operating theatres per 100 000, more than any other district. (Table 78).

Table 78: KwaZulu-Natal private hospital surgical beds and operating theatres per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000	Operating theatres	Operating theatres per 100 000
Amajuba	507 467	36	7.09	5	0.99
eThekwini	3 464 205	963	27.80	109	3.15
iLembe	630 464	25	3.97	3	0.48
Harry Gwala	471 904	37	7.84	4	0.85
Ugu	733 228	83	11.32	9	1.23
uMgungundlovu	1 052 730	134	12.73	16	1.52
uMkhanyakude	638 011	0	0	0	0
uMzinyathi	514 217	0	0	0	0
uThukela	682 797	34	4.98	3	0.44
uThungulu	937 793	134	14.29	12	1.28
Zululand	824 091	3	0.36	1	0.12

9.1 Limpopo Provincial Results

Limpopo province has the 5th largest population in SA and is also the poorest of all provinces, with most of the districts falling into the two worst socio-economic quintiles in SA. The medical aid coverage is the lowest in the country (8.7%), and the majority of people rely on the public health sector.



Map 22: District Municipality map of Limpopo. [8]

Capricorn District:

Capricorn District is located on the north-western side Limpopo and is predominantly rural. It consists of five sub-districts; Aganang, Blouberg, Lepelle-Nkumpi, Molemole and Polokwane. The district fell in the SEQ 2, and had an estimated medical aid coverage of 6.6%. [64]

There were six district and two central hospitals (0.63 per 100 000), with 1 851 public sector hospital beds (146.36 per 100 000), 284 surgical beds (22.46 per 100 000) and 19 operating theatres (1.50 per 100 000). There were three specialist general surgeons (0.24 per 100 000) and 51 non-specialist general surgeons (4.03 per 100 000) working in the public sector. There was one private hospital (0.08 per 100 000), with 247 private sector beds (19.53 per 100 000), 105 surgical beds (8.30 per 100 000) and eight operating theatres (0.63 per 100 000).

Sekhukhune District:

Sekhukhune District is located in Limpopo and lies in the south-eastern part of the province. It comprises five sub-districts; Elias Motsoaledi, Ephraim Mogale, Fetakgomo, Makhuduthamaga and Greater Tubatse. The district fell in the SEQ 1, which was amongst the poorest districts, and had an estimated medical aid coverage of 7.1%. [64] There were five district and two regional hospitals (0.63 per 100 000), with 1 189 public sector hospital beds (107.40 per 100 000), 202 surgical beds (18.25 per 100 000) and eight operating theatres (0.72 per 100 000). The surgical services were provided by 36 non-specialist surgeons (3.25 per 100 000) working in the public sector. There were no specialist general surgeons or private hospitals in the district.

Mopani District:

Mopani District is located within the north-eastern quadrant of Limpopo and consists of five sub-districts namely; BaPhalaborwa, Greater Giyani, Greater Letaba, Greater Tzaneen and Maruleng. It is bordered in the east by Mozambique, in the north by Zimbabwe and Vhembe, in the south by Ehlanzeni (MP), in the west by Capricorn, and in the south-west by Sekhukhune. The district had an estimated medical aid coverage of 9.4% and fell into SEQ 2. [64]

There were six district and one regional hospital (0.62 per 100 000), with 1 229 public sector hospital beds (109.50 per 100 000), 188 surgical beds (16.75 per 100 000) and 11 public operating theatres (0.98 per 100 000). There were three specialist general surgeons (0.27 per 100 000) and 19 non-specialist general surgeons (1.69 per 100 000), working in the public sector. There was one private hospital (0.08 per 100 000), with 129 private sector beds (11.49 per 100 000), 35 surgical beds (3.12 per 100 000) and three operating theatres (0.27 per 100 000).

Vhembe District:

Vhembe District is located in the northern part of the Limpopo and is predominantly rural. It shares borders with Zimbabwe and Botswana in the north-west and Mozambique in the south-east through the Kruger National Park. Vhembe District comprises four sub-districts; Musina, Mutale, Thulamela and Makhado. The district fell in the SEQ 2, and had an estimated medical aid coverage of 7.2%. Vhembe is one of the 11 National NHI pilot districts. [64] There were six district and one regional hospital (0.53 per 100 000), with 1 786 public sector hospital beds (134.50 per 100 000), 235 surgical beds (14.16 per 100 000) and 11 public operating theatres (0.83 per 100 000). There were 49 non-specialist surgeons (3.69 per 100 000) and no specialist surgeons working in the public sector. There was one private hospital (0.08 per 100 000), with 22 private sector hospital beds (1.66 per 100 000), six surgical beds (0.45 per 100 000) and one operating theatre.

Waterberg District:

Waterberg District is located on the western part of Limpopo. Waterberg District comprises six sub-districts; Bela-Bela, Lephalale, Modimolle, Mogalakwena, Mookgophong and Thabazimbi. The district fell in the SEQ 3 and had an estimated medical aid coverage of 16.7%, the highest in the province. [64] There were seven district and one regional hospital (1.12 per 100 000), with 1 186 public sector hospital beds (167.35 per 100 000), 171 surgical beds (24.13 per 100 000) and 14 operating theatres (1.98 per 100 000). There were 50 non-specialist surgeons (7.06 per 100 000) and no specialist surgeons working in the public sector. There were four private hospitals (0.56 per 100 000), with 178 private sector beds (25.12 per 100 000), 51 surgical beds (7.20 per 100 000) and six operating theatres (0.85 per 100 000). The number of private hospitals had halved since 2007. Since there were no specialist general surgeons working in the public sector, those living in this district were more than likely working in the private sector.

Tables 79 and 80 demonstrate the total number of surgical resources, and the surgical resources per 100 000 in Limpopo.

Table 79: Limpopo surgical resources by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Capricorn	8	1	1 851	247	284	105	3	51	19	8
Sekhukhune	7	0	1 189	0	202	0	0	36	8	0
Mopani	7	1	1 229	129	188	35	3	19	11	3
Vhembe	7	1	1 786	22	235	6	0	49	11	1
Waterberg	8	4	1 186	178	171	51	0	50	14	6

Table 80: Limpopo surgical resources per 100 000 population, by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Capricorn	0.63	0.08	146.36	19.53	22.46	8.30	0.24	4.03	1.50	0.63
Sekhukhune	0.63	0	107.40	0	18.25	0	0	3.25	0.72	0
Mopani	0.62	0.08	109.50	11.49	16.75	3.12	0.27	1.69	0.98	0.27
Vhembe	0.53	0.08	134.50	1.66	14.16	0.45	0	3.69	0.83	0.08
Waterberg	1.12	0.56	167.35	25.12	24.13	7.20	0	7.06	1.98	0.85

9.2 Resources in the public sector

The Limpopo province had a total of 37 public hospitals distributed across the five district municipalities. There were an estimated 7 241 total hospital beds, 1 080 surgical beds and 63 operating theatres in the public sector. There were 16 registered specialist general surgeons, of which six (37.5%) were working in the public sector. There were an estimated 205 non-specialist doctors performing common general surgical procedures in Limpopo. Table 81 demonstrates all public hospital data for each hospital by district _ Appendix K).

9.2.1 Hospitals and total beds in the public sector

There were a similar number of public hospitals in the district municipalities. Waterberg had the most hospitals per population (1.12 per 100 000). Capricorn and Vhembe had the most public hospital beds, and Waterberg had the largest number of beds per population (167.35 per 100 00). (Table 82).

Table 82: Limpopo public hospitals and hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Capricorn	1 264 685	8	0.63	1 851	146.36
Sekhukhune	1 106 993	7	0.63	1 189	107.40
Mopani	1 122 345	7	0.62	1 229	109.50
Vhembe	1 327 785	7	0.53	1 786	134.50
Waterberg	708 683	8	1.12	1 186	167.35

Table 83 _ (Appendix K) shows the changes which have taken place since 2007. There was a decrease in the number of district and regional facilities from 2007 to 2014. There were a decrease in bed numbers of about 2 000 beds during the seven year period, with the reduction occurring largely in Capricorn. There was, however a 200-bed increase in Waterberg. (Figure 31 and 32 _ Appendix K).

9.2.2 Surgical beds in the public sector

Capricorn had the largest absolute number of surgical beds (n=284) and Waterberg, being much less inhabited, had the largest number of surgical beds per population (24.13 per 100 000). (Table 84). Vhembe had the fewest number of public surgical beds per population (14.16 per 100 000), despite having the second highest number of surgical beds (n=235).

Table 84: Limpopo public hospital surgical beds per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000
Capricorn	1 264 685	284	22.46
Sekhukhune	1 106 993	202	18.25
Mopani	1 122 345	188	16.75
Vhembe	1 327 785	235	14.16
Waterberg	708 683	171	24.13

9.2.3 Number of general surgeons and operating theatres in the public sector

Three of the five district municipalities had no specialist general surgeons working in public hospitals, and the overall specialists per 100 000 in the remaining two districts were amongst the lowest in the country. There were a reasonable number of non-specialist general surgeons in almost all of the district municipalities and in particular the Waterberg district, with 7.06 per 100 000. Table 85. (Figure 33 _ Appendix K). The largest number of functional operating theatres were in Capricorn (n=19) and the largest number per population were in Waterberg with 1.98 theatres per 100 000.

Table 85: Limpopo public hospital general surgeons and operating theatres per 100 000 by region.

Region	Population (2014)	Specialist general surgeons	Specialist general surgeons per 100 000	Non-specialist surgeons	Non-specialist surgeons per 100 000	Operating theatres	Operating theatres per 100 000
Capricorn	1 264 685	3	0.24	51	4.03	19	1.50
Sekhukhune	1 106 993	0	0	36	3.25	8	0.72
Mopani	1 122 345	3	0.27	19	1.69	11	0.98
Vhembe	1 327 785	0	0	49	3.69	11	0.83
Waterberg	708 683	0	0	50	7.06	14	1.98

9.3 Resources in the private sector

There were seven private hospitals in Limpopo, with a total of 576 usable hospital beds in four of the five district municipalities. There were 197 surgical beds and 18 functional operating theatres in the private sector. (Table 86 _ Appendix K).

9.3.1 Hospitals and total beds in the private sector

Waterberg had the largest number of private hospitals (n=4), despite having the fewest number of inhabitants. The remaining districts had either one or no private facilities demonstrating a scarcity in this rural province. (Table 87). The largest number of total private hospital beds per population were located in Waterberg with 25.12 per 100 000.

Table 87: Limpopo private hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Capricorn	1 264 685	1	0.08	247	19.53
Sekhukhune	1 106 993	0	0	0	0
Mopani	1 122 345	1	0.08	129	11.49
Vhembe	1 327 785	1	0.08	22	1.66
Waterberg	708 683	4	0.56	178	25.12

Comparative data showed that although the number of private hospitals had halved over the seven year period, particularly in Waterberg, there had been an overall increase in private bed numbers in Capricorn, Mopani and Waterberg. Table 88 (Figures 34 and 35 _ Appendix K).

Table 88: Limpopo private hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	Private hospitals 2007	Private hospitals 2014	Private beds 2007	Private beds 2014
Bohlabela (eliminated)	0	0	0	0
Capricorn	1	1	193	247
Sekhukhune	0	0	0	0
Mopani	1	1	64	129
Vhembe	0	1	0	22
Waterberg	12	4	102	178
Total	14	7	359	576

9.3.2 Number of surgical beds and operating theatres in the private sector

The largest number of surgical beds and surgical beds per population were in Capricorn. In addition, Capricorn district municipality had eight functional operating theatres (0.63 per 100 000). However, the largest number of surgical beds per population were in Waterberg (0.85 per 100 000). (Table 89).

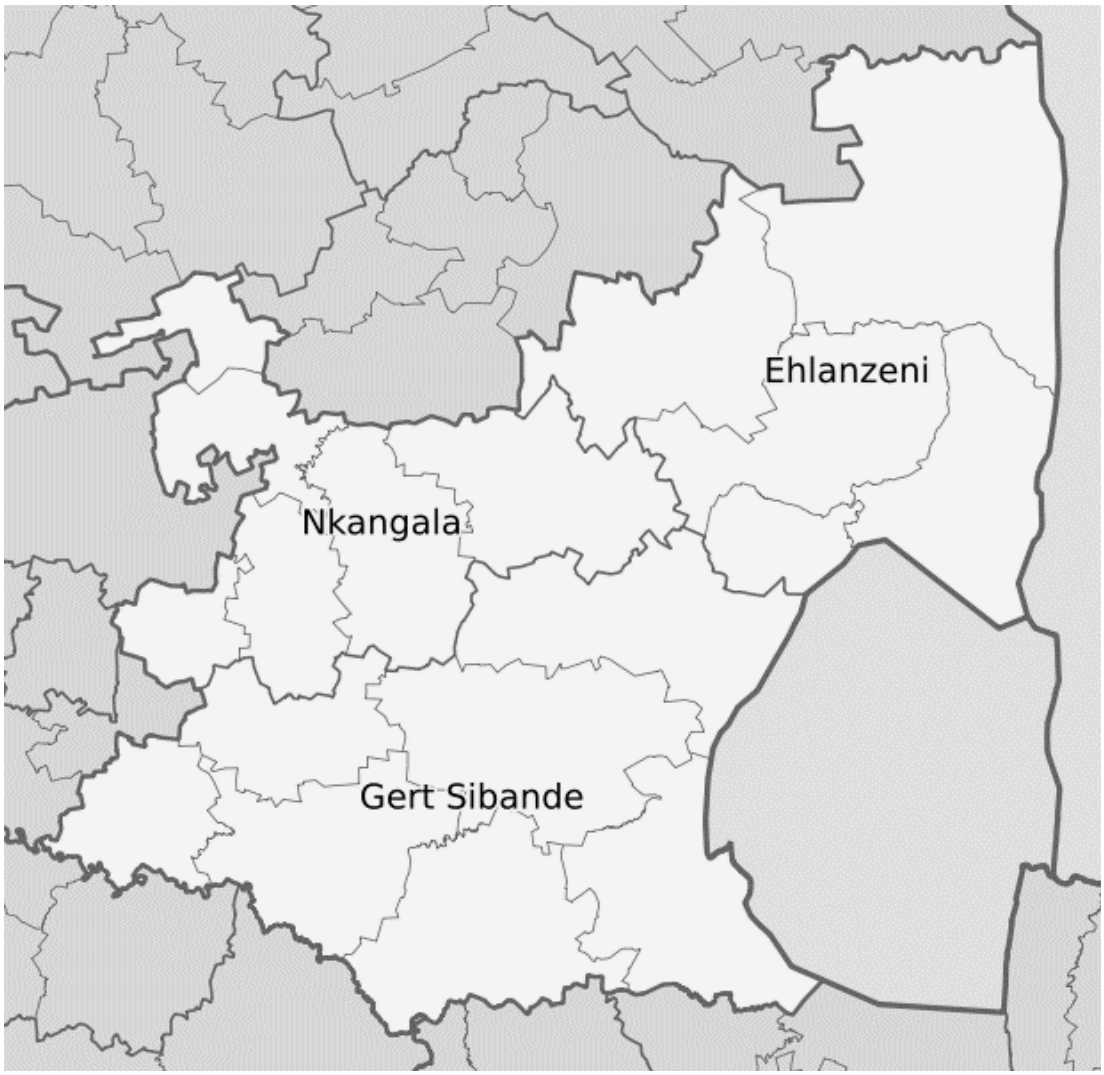
Table 89: Limpopo private hospital surgical beds and operating theatres per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000	Operating theatres	Operating theatres per 100 000
Capricorn	1 264 685	105	8.30	8	0.63
Sekhukhune	1 106 993	0	0	0	0
Mopani	1 122 345	35	3.12	3	0.27
Vhembe	1 327 785	6	0.45	1	0.08
Waterberg	708 683	51	7.20	6	0.85

Chapter 10: Surgical Resources in the Mpumalanga Province

10.1 Mpumalanga Provincial Results

Mpumalanga is situated in the north-eastern part of South Africa, and consists of just under five million people. Over four million people (86.7%) do not have access to a medical aid and depend on the public health system.



Map 23: District Municipality map of Mpumalanga. [9]

Ehlanzeni District:

Ehlanzeni District is situated in the north-eastern part of Mpumalanga and has five sub-districts; Bushbuckridge, Mbombela, Nkomazi, Thaba Chweu and Umjindi. The district fell in the SEQ 4, which was amongst the second wealthiest districts, and had an estimated medical aid coverage of 11.8%. [64] There were eight district, two regional and one central hospital (0.64 per 100 000), with 2 385 public sector hospital beds (139.14 per 100 000), 360 surgical beds (21 per 100 000) and 25 public operating theatres (1.46 per 100 000). There were four specialist general surgeons (0.23 per 100 000) and 27 non-specialist surgeons (1.56 per 100 000) working in public hospitals. There were two private hospitals (0.12 per 100 000), with 344 beds (0.07 per 100 000), 94 surgical beds (5.48 per 100 000) and ten operating theatres (0.58 per 100 000).

Gert Sibande District:

Gert Sibande District is situated in the southern part of the province, bordering on Swaziland in the east, Free State and KwaZulu-Natal in the south, and Gauteng in the west. The district had an estimated medical aid coverage of 16.1%, which was the highest in the Mpumalanga. The district fell in the SEQ 3 and is one of the 11 NHI pilot districts. [64] There were eight district hospitals and one regional hospital (0.85 per 100 000), with 1 292 public sector hospital beds (122.33 per 100 000), 283 surgical beds (26.79 per 100 000) and 19 operating theatres (1.80 per 100 000). There were 35 non-specialist surgeons providing surgical services for just over one million people. There were five private hospitals (0.47 per 100 000), with 434 private beds (41.09 per 100 000), 156 surgical beds (14.77 per 100 000) and 12 private operating theatres (1.14 per 100 000).

Nkangala District:

Nkangala District is situated in the north-western part of Mpumalanga and has six sub-districts; Dr JS Moroka, Emakhazeni, Emalahleni, Steve Tshwete, Thembisile Hani and Victor Khanye. The district fell in the SEQ 4, which was amongst the wealthiest districts, and had an estimated medical aid coverage of 13.2%. [64] There were seven district and one regional hospital (0.59 per 100 000), with 1 115 public sector beds (82.12 per 100 000), 201 surgical beds (14.80 per 100 000) and 16 operating theatres (1.18 per 100 000). There was one specialist general surgeon (0.07 per 100 000) and 27 non-specialist general surgeons (1.99 per 100 000), working in the public sector. There were five private hospitals (0.37 per 100 000), with 604 beds (44.49 per 100 000), 156 surgical beds (11.49 per 100 000) and 17 private operating theatres (1.25 per 100 000).

Tables 90 and 91 demonstrate the total number of surgical resources, and the surgical resources per 100 000 in Limpopo.

Table 90: Mpumalanga surgical resource numbers by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Ehlanzeni	11	2	2385	344	360	94	4	27	25	10
G Sibande	9	5	1292	434	283	156	0	35	19	12
Nkangala	8	5	1115	604	201	156	1	27	16	17

Table 91: Mpumalanga surgical resources per 100 000 population, by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Ehlanzeni	0.64	0.12	139.14	20.07	21.00	5.48	0.23	1.56	1.46	0.58
G Sibande	0.85	0.47	122.33	41.09	26.79	14.77	0	3.31	1.80	1.14
Nkangala	0.59	0.37	82.12	44.49	14.80	11.49	0.07	1.99	1.18	1.25

10.2 Resources in the public sector

Mpumalanga had a total of 28 public hospitals distributed across the three district municipalities. There were an estimated 4 792 total hospital beds, 844 surgical beds and 60 operating theatres in the public sector. There were 23 registered specialist general surgeons, of which five (21.7%) were working in the public sector. There were 89 non-specialist surgeons performing common general surgical procedures in the Mpumalanga province. Table 92 demonstrates all public hospital data for each hospital by district _ Appendix L).

10.2.1 Hospitals and total beds in the public sector

The largest number of public sector hospitals were located in Ehlanzeni and the largest number per population were in Gert Sibande (0.85 per 100 000). (Table 93). Ehlanzeni had the largest total number of hospital beds which translates into 139.14 per 100 000.

Table 93: Mpumalanga public hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Ehlanzeni	1 714 047	11	0.64	2 385	139.14
G Sibande	1 056 178	9	0.85	1 292	122.33
Nkangala	1 357 744	8	0.59	1 115	82.12

Table 94 demonstrates the current data compared to that of the 2007 HST data. There was an increase in the number of district hospitals from 18 to 23, as well as in central hospitals with both Rob Ferreira and Witbank hospitals being classified as level three hospitals. There was an increase in the overall public hospital bed number by 600 beds. It was the only province which experienced an increase in public hospital bed number between 2007 and 2014. (Figures 36 and 37 _ Appendix L).

Table 94: Mpumalanga public hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	District 2007	District 2014	Regional 2007	Regional 2014	Central 2007	Central 2014	Public beds 2007	Public beds 2014
Ehlanzeni	6	8	2	2	0	1	1 828	2 385
G Sibande	7	8	1	1	0	0	1 425	1 292
Nkangala	5	7	1	0	1	1	921	1 115
Total	18	23	4	3	1	2	4 174	4 792

10.2.2 Surgical beds in the public sector

Ehlanzeni had the largest absolute number of surgical beds (n=360) and Nkangala had the fewest (n=201). Gert Sibande District had the most public surgical beds per population with 26.79 per 100 000. (Table 95).

Table 95: Mpumalanga public hospital surgical beds per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000
Ehlanzeni	1 714 047	360	21.00
G Sibande	1 056 178	283	26.79
Nkangala	1 357 744	201	14.80

10.2.3 Number of general surgeons and operating theatres in the public sector

Ehlanzeni had the largest number of specialist surgeons located at Rob Ferreira hospital, giving the district 0.23 specialist surgeons per 100 000 (public sector). Gert Sibande district had the largest number of non-specialist general surgeons with a total of 35 (3.31 per 100 000). There were 35 functional operating theatres in the public sector, most of which were located in Ehlanzeni (n=25), providing 1.46 theatres per 100 000. (Table 96). (Figure 38 _ Appendix L).

Table 96: Mpumalanga public hospital general surgeons and operating theatres per 100 000 by region.

Region	Population (2014)	Specialist general surgeons	Specialist general surgeons per 100 000	Non-specialist surgeons	Non-specialist surgeons per 100 000	Operating theatres	Operating theatres per 100 000
Ehlanzeni	1 714 047	4	0.23	27	1.56	25	1.46
G Sibande	1 056 178	0	0	35	3.31	19	1.80
Nkangala	1 357 744	1	0.07	27	1.99	16	1.18

10.3 Resources in the private sector

There were 12 private hospitals in Mpumalanga with a total of 1 382 usable hospital beds in all of the district municipalities. There were 406 surgical beds and 39 functional operating theatres. (Table 97 _ Appendix L).

10.3.1 Hospitals and total beds in the private sector

The largest number of private hospitals were located in Gert Sibande and Nkangala, with the latter having the largest number per population (0.47 per 100 000). The largest number of private hospital beds were located in Nkangala (n=604), which had 44.49 per 100 000. Table 98 (Figure 39 and 40 _ Appendix L).

Table 98: Mpumalanga private hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Ehlanzeni	1 714 047	2	0.12	344	20.07
G Sibande	1 056 178	5	0.47	434	41.09
Nkangala	1 357 744	5	0.37	604	44.49

Comparative data between 2007 and 2014 showed an increase in hospital number and an overall increase in private bed number by approximately 400 beds. (Table 99 _ Appendix L).

10.3.2 Number of surgical beds and operating theatres in the private sector

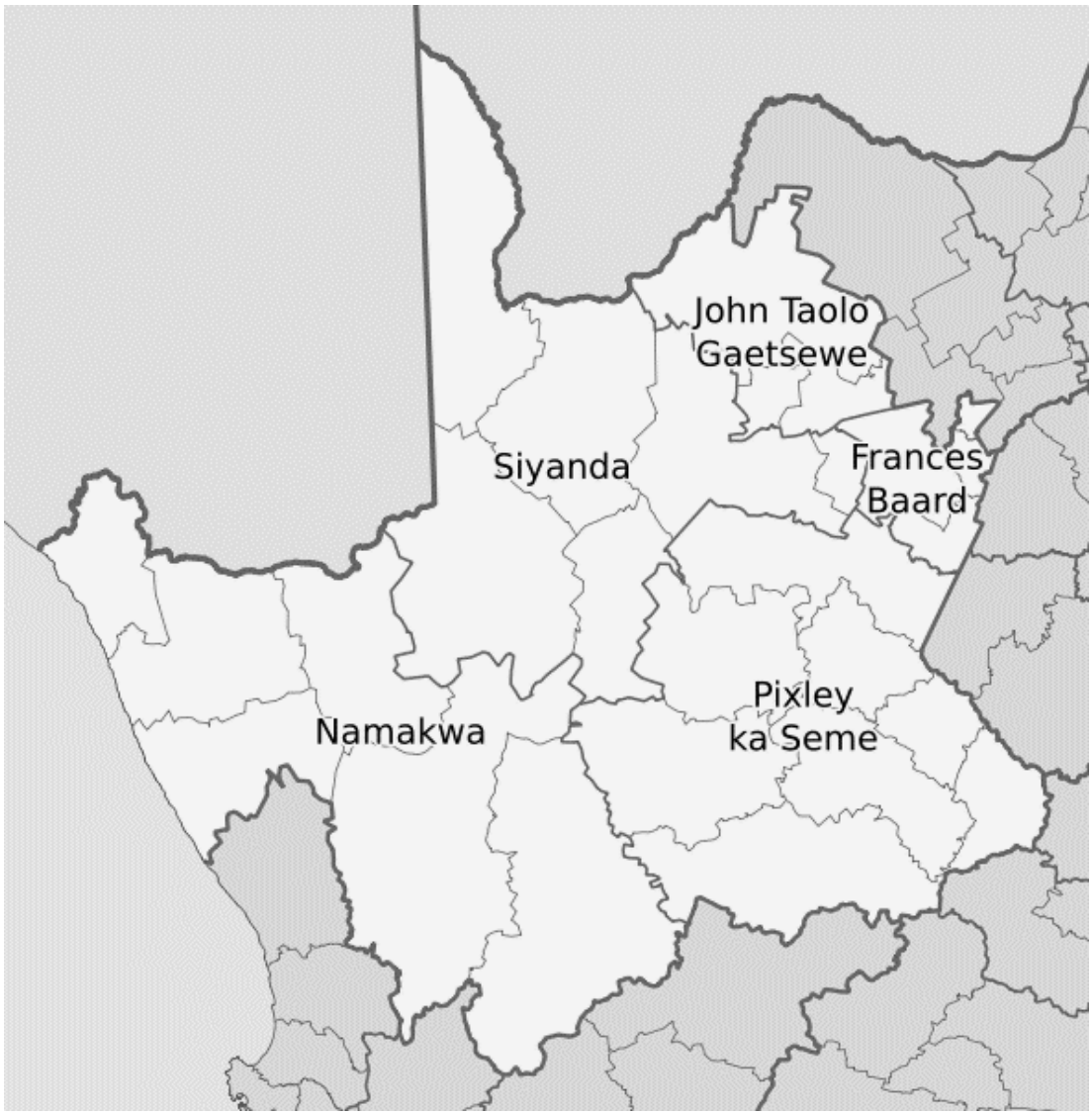
The largest number of surgical beds were in Gert Sibande, which had a similar number of private surgical beds as Nkangala (n=156), but fewer beds per 100 000. Nkangala had 17 functional operating theatres with 1.25 per 100 000. (Table 100).

Table 100: Mpumalanga private hospital surgical beds and operating theatres per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000	Operating theatres	Operating theatres per 100 000
Ehlanzeni	1 714 047	94	5.48	10	0.58
G Sibande	1 056 178	156	14.77	12	1.14
Nkangala	1 357 744	156	11.49	17	1.25

11.1 Northern Cape Provincial Results

The Northern Cape has the lowest population density of all the provinces. It contains just over 2% of the country's population, with 15.4% of the population having medical aid coverage. The ZF Mgcawu District Municipality was previously known (before 1 July 2013) as Siyanda.



Map 24: District Municipality map of the Northern Cape. [10]

Frances Baard District:

Frances Baard District is located in the far eastern part of the Northern Cape and is bordered by the North West and Free State Provinces. It comprises four sub-districts; Dikgatlong, Magareng, Phokwane and Sol Plaatje. Although it is the smallest district in the province, the district comprises the largest proportion of the population of the Northern Cape. The district fell in the SEQ 4, which was amongst the wealthier districts. It had an estimated medical aid coverage of 14.3%. [64] There were four district and one regional hospital (1.31 per 100 000), with 833 public sector hospital beds (219.58 per 100 000), 158 surgical beds (41.64 per 100 000) and seven operating theatres (1.85 per 100 000). There were four specialist general surgeons (1.05 per 100 000) and 19 non-specialist general surgeons (5 per 100 000) working in the public sector. There was one private hospital (0.26 per 100 000), with 252 hospital beds (66.43 per 100 000), 91 surgical beds (23.99 per 100 000) and eight operating theatres (2.10 per 100 000).

John Taolo Gaetsewe District:

John Taolo Gaetsewe District, formerly known as Kgalagadi, is situated in the northern part of the Northern Cape and comprises three sub-districts; Gamagara, Ga-Segonyana and Joe Morolong (Moshaweng). The district fell in SEQ 2, and had an estimated medical aid coverage of 12.2%. [64] There were two district hospitals (0.87 per 100 000), with 283 public sector hospital beds (122.54 per 100 000), 50 surgical beds (21.65 per 100 000) and two operating theatres (0.87 per 100 000). There were 12 non-specialist general surgeons (5.20 per 100 000) working in the public hospitals without any specialist general surgeons. There was one private hospital (0.43 per 100 000), with 25 beds (10.83 per 100 000), eight surgical beds (3.47 per 100 000) and one operating theatre (0.43 per 100 000).

Namakwa District:

Namakwa District comprises six sub-districts; Nama Khoi, Hantam, Khâi-Ma, Kamiesberg, Karoo Hoogland and Richtersveld. It is bordered by the Republic of Namibia in the north, ZF Mgcawu District (previously Siyanda) in the north-east, Pixley ka Seme in the east, Central Karoo District in the south-east, Cape Winelands district in the south, West Coast District in the south-west, and the Atlantic Ocean to the west. The district fell in the SEQ 4, which was amongst the wealthier districts. The district had estimated medical scheme coverage of 21.5%. [64] There were two district hospitals (1.69 per 100 000), with 102 hospital beds (86.11 per 100 000), 11 surgical beds (9.20 per 100 000) and three public operating theatres (2.53 per 100 000). There were nine non-specialist general surgeons (7.60 per 100 000) for just over 100 000 people. There was one private hospital (0.84 per 100 000), with 34 beds (28.70 per 100 000), ten surgical beds (8.44 per 100 000) and one operating theatre (0.84 per 100 000).

Pixley ka Seme District:

Pixley ka Seme District is the second largest district municipality in the Northern Cape. It comprises eight sub-districts; Ubuntu, Umsobomvu, Emthanjeni, Kareeberg, Renosterberg, Thembelihle, Siyathemba and Siyancuma. The district fell in the SEQ 2, and had an estimated medical aid coverage of 15.8%. Pixley ka Seme is one of the 11 NHI pilot districts. [64] There were four district hospitals (2.11 per 100 000), half as many as in 2007. There were 148 public sector hospital beds (77.89 per 100 000), two surgical beds (1.05 per 100 000) and three operating theatres (1.58 per 100 000). The surgical bed number does not reflect the actual bed number, as district hospitals tend to have a male and female ward without specific allocation of medical or surgical beds. There was one specialist general surgeon (0.53 per 100 000) and seven non-specialist general surgeons (3.68 per 100 000) working in the public sector. There were no private hospitals in the district.

ZF Mgcawu District:

ZF Mgcawu District, formerly known as Siyanda District Municipality, is in the mid-northern section of the Northern Cape on the border with Botswana. The district comprises six sub-districts; Mier, Kai!Garib, !Khara Hais, Tsantsabane, !Kheis and Kgatelopele. It covers almost 30% of the entire province but is scarcely populated. The district fell in the SEQ 3, and had an estimated medical aid coverage of 16.5%. [64] There were four district hospitals (1.64 per 100 000), with 288 beds (117.96 per 100 000), 71 public surgical beds (29.08 per 100 000) and two operating theatres (0.82 per 100 000). There were five non-specialist surgeons (2.05 per 100 000) for 244 154 people. There was one private hospital (0.41 per 100 000), with 50 beds (20.48 per 100 000), 17 surgical beds (6.96 per 100 000) and two private operating theatres (0.82 per 100 000).

Tables 101 and 102 demonstrate the total number of surgical resources, and the surgical resources per 100 000 in the Northern Cape.

Table 101: Northern Cape surgical resource numbers by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Frances Baard	5	1	833	252	158	91	4	19	7	8
JT Gaetsewe	2	0	283	0	50	8	0	12	2	1
Namakwa	2	1	102	34	11	10	0	9	3	1
Pixley ka Seme	4	0	148	0	2	0	1	7	3	0
ZF Mgcawu	4	1	288	50	71	17	0	5	2	2

Table 102: Northern Cape surgical resources per 100 000 population, by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Frances Baard	1.31	0.26	219.58	66.43	41.64	23.99	1.05	5.00	1.85	2.10
JT Gaetsewe	0.87	0	122.54	0	21.65	3.47	0	5.20	0.87	0.43
Namakwa	1.69	0.84	86.11	28.70	9.20	8.44	0	7.60	2.53	0.84
Pixley ka Seme	2.11	0	77.89	0	1.05	0	0.53	3.68	1.58	0
ZF Mgcawu	1.64	0.41	117.96	20.48	29.08	6.96	0	2.05	0.82	0.82

11.2 Resources in the public sector

The Northern Cape had a total of 17 public hospitals distributed across the five district municipalities. There were 1 654 total hospital beds, 292 surgical beds and 17 operating theatres in the public sector. There were ten registered specialist general surgeons, of which five (50%) were working in the public sector. There were an estimated 52 non-specialist surgeons performing common general surgical procedures in the Northern Cape. Table 103 demonstrates all public hospital data for each hospital by district _ (Appendix M).

11.2.1 Hospitals and total beds in the public sector

The Frances Baard district had the largest number of public hospitals but Pixley ka Seme had the largest number per population (2.11 per 100 000). Frances Baard had 833 public hospital beds per population (219.58 beds per 100 000) and Pixley ka Seme had the fewest with 77.89 per 100 000. (Table 104). Table 105 shows current data compared to that of the 2007 HST data. There was a decrease in the number of facilities from 2007 to 2014, largely in Namakwa and Pixley ka Seme. There was a marginal decrease in bed number of around 50 beds during the seven year period. (Table 105, Figures 41 and 42 _ Appendix M).

Table 104: Northern Cape public hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Frances Baard	379 352	5	1.31	833	219.58
JT Gaetsewe	230 938	2	0.87	283	122.54
Namakwa	118 450	2	1.69	102	86.11
Pixley ka Seme	190 019	4	2.11	148	77.89
ZF Mgcawu	244 154	4	1.64	288	117.96

11.2.2 Surgical beds in the public sector

Frances Baard had the largest absolute number of surgical beds (n=158) as well as largest number per population (41.64 per 100 000). (Table 106). Pixley ka Seme had very few specific beds allocated to surgical patients, as the district level facilities were small and usually only comprised of a male and female ward with patients who have a mixture of pathologies.

Table 106: Northern Cape public hospital surgical beds per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000
Frances Baard	379 352	158	41.64
JT Gaetsewe	230 938	50	21.65
Namakwa	118 450	11	9.20
Pixley ka Seme	190 019	2	1.05
ZF Mgcawu	244 154	71	29.08

11.2.3 Number of general surgeons and operating theatres in the public sector

Frances Baard had the largest number of specialists located at the only regional hospital (Kimberley hospital). There were 1.05 specialist general surgeons in the public sector per 100 000. Although this was a small number, it was more than three of the districts that had no specialist general surgeons working in public hospitals. There were 52 non-specialist general surgeons spread across all of the district municipalities, with the majority practising in Frances Baard. Table 107. (Figure 43 _ Appendix M). There were 17 functional operating theatres in the public sector and again these were predominately concentrated in the Frances Baard district municipality, with five of them at Kimberly hospital. (Table 107).

Table 107: Northern Cape public hospital general surgeons and operating theatres per 100 000 by region.

Region	Population (2014)	Specialist general surgeons	Specialist general surgeons per 100 000	Non-specialist surgeons	Non-specialist surgeons per 100 000	Operating theatres	Operating theatres per 100 000
Frances Baard	379 352	4	1.05	19	5.00	7	1.85
JT Gaetsewe	230 938	0	0	12	5.20	2	0.87
Namakwa	118 450	0	0	9	7.60	3	2.53
Pixley ka Seme	190 019	1	0.53	7	3.68	3	1.58
ZF Mgcawu	244 154	0	0	5	2.05	2	0.82

11.3 Resources in the private sector

There were four private hospitals in the Northern Cape with a total of 361 usable hospital beds in four of the five district municipalities. There are 126 surgical beds and 12 functional operating theatres. (Table 108 _ Appendix M).

11.3.1 Hospitals and total beds in the private sector

The private hospitals were located in Frances Baard, JT Gaetsewe, Namakwa and ZF Mgcawu. The hospitals per 100 000 were expectedly low demonstrating a similarity to other parts of rural Limpopo, Eastern Cape and KwaZulu-Natal. The largest number of private hospital beds were in Frances Baard (n=252), followed by ZF Mgcawu (n=50) and Namakwa (n=34). (Table 109). Comparative data shows that there was a marginal increase in facility number, however bed numbers remained similar. (Table 110 and Figure 44 _ Appendix M).

Table 109: Northern Cape private hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Frances Baard	379 352	1	0.26	252	66.43
JT Gaetsewe	230 938	1	0.43	25	10.83
Namakwa	118 450	1	0.84	34	28.70
Pixley ka Seme	190 019	0	0	0	0
ZF Mgcawu	244 154	1	0.41	50	20.48

11.3.2 Number of surgical beds and operating theatres in the private sector

The largest number of surgical beds and surgical beds per 100 000 were in Frances Baard. Similarly, Frances Baard had the largest number of private operating theatres (n=8) with 2.10 per 100 000. (Table 111).

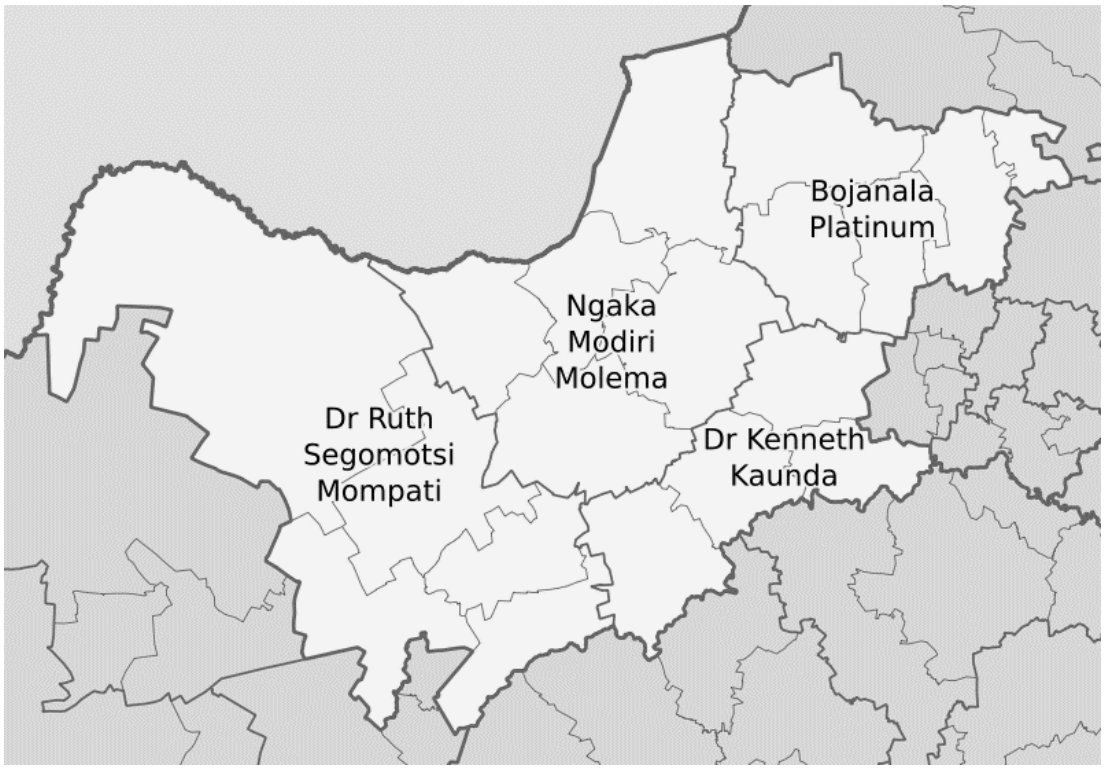
Table 111: Northern Cape private hospital surgical beds and operating theatres per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000	Operating theatres	Operating theatres per 100 000
Frances Baard	379 352	91	23.99	8	2.10
JT Gaetsewe	230 938	8	3.47	1	0.43
Namakwa	118 450	10	8.44	1	0.84
Pixley ka Seme	190 019	0	0	0	0
ZF Mgcawu	244 154	17	6.96	2	0.82

Chapter 12: Surgical Resources in the North West Province

12.1 North West Provincial Results

The North West province has a population of around 3.6 million people, and is the 3rd poorest province in the country. There are four district municipalities and an estimated 13.7% of its population have medical aid coverage. [64]



Map 25: District Municipality map of the North West. [11]

Bonjala Platinum District:

Bojanala is one of the four districts of the North West and comprises five sub-districts; Kgetlengrivier, Madibeng, Moses Kotane, Moretele and Rustenburg. The district had an estimated medical aid coverage of 13.1% and was in the mid socio-economic quintile (SEQ 3). [64]

There were three district and one regional hospital (0.26 per 100 000), with 721 public sector hospital beds (46.06 per 100 000), 99 surgical beds (6.32 per 100 000) and nine operating theatres (0.57 per 100 000). There were four specialist general surgeons (0.26 per 100 000), and 32 non-specialist general surgeons (2.04 per 100 000) working in the public sector. There were five private hospitals (0.31 per 100 000), with 498 beds (31.81 per 100 000), 221 surgical beds (4.11 per 100 000) and 16 operating theatres (1.02 per 100 000).

Dr Ruth Segomotsi Mompati District:

Dr Ruth Segomotsi Mompati District (previously known as Bophirima), has five sub-districts; Greater Taung, Kagisano Molopo, Lekwa-Teemane, Mamusa and Naledi. The district fell into SEQ 1, which was the most deprived in the province. The district had an estimated medical aid coverage of 6.2%, which was the lowest in the province. [64] There were four district and one regional hospital (1.06 per 100 000), with 556 beds (117.79 per 100 000), 82 surgical beds (17.34 per 100 000) and nine operating theatres (1.90 per 100 000). There were five specialist general surgeons (1.06 per 100 000), and 18 non-specialist general surgeons (3.81 per 100 000) working in the public sector. There was one private hospital (0.21 per 100 000), with 44 beds (9.32 per 100 000), eight surgical beds (1.70 per 100 000) and two operating theatres (0.42 per 100 000).

Ngaka Modiri Molema District:

Ngaka Modiri Molema District (previously known as Central District) has five sub-districts; Ditsobotla, Mahikeng, Ramotshere Moiloa, Ratlou and Tswaing. The district fell into SEQ 2 and had an estimated medical aid coverage of 8.1%. [64] There were four district and one regional hospital (0.59 per 100 000), with 869 beds (101.92 per 100 000), 210 surgical beds (24.62 per 100 000) and nine operating theatres (1.06 per 100 000).

There were two specialist general surgeons (0.24 per 100 000) and 24 non-specialist surgeons (2.81 per 100 000) working in the public sector. There was one private hospital (0.12 per 100 000), with 93 beds (10.91 per 100 000), 45 surgical beds (5.28 per 100 000) and three private operating theatres (0.35 per 100 000).

Dr Kenneth Kaunda District:

Dr Kenneth Kaunda District (previously known as Southern District), has four sub-districts; Maquassi Hills, Matlosana, Tlokwe and Ventersdorp. The district fell into SEQ 4, and is in a better financial position than the other districts. It had an estimated medical aid coverage of 23.7%, which was the highest in the province. Dr Kenneth Kaunda District is one of the 11 NHI pilot districts. [64] There were two district and two regional hospitals (0.57 per 100 000), with 1 266 beds (178.95 per 100 000), 236 surgical beds (33.36 per 100 000) and 19 operating theatres (2.69 per 100 000). There were three specialist general surgeons (0.43 per 100 000) and 33 non-specialist surgeons (4.66 per 100 000) working in the public sector. There were seven private hospitals (0.99 per 100 000, with 830 beds (117.32 per 100 000), 302 surgical beds (42.69 per 100 000) and 24 operating theatres (3.39 per 100 000).

Tables 112 and 113 demonstrate the total number of surgical resources, and the surgical resources per 100 000 in the North West.

Table 112: North West surgical resource numbers by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Bonjala	4	5	721	498	99	221	4	32	9	16
RS Mompati	5	1	556	44	82	8	5	18	9	2
NM Molema	5	1	869	93	210	45	2	24	9	3
K Kaunda	4	7	1 266	830	236	302	3	33	19	24

Table 113: North West surgical resources per 100 000 population, by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Bonjala	0.26	0.31	46.61	31.81	6.32	4.11	0.26	2.04	0.57	1.02
RS Mompati	1.06	0.21	117.79	9.32	17.34	1.70	1.06	3.81	1.90	0.42
NM Molema	0.59	0.12	101.92	10.91	24.62	5.28	0.24	2.81	1.06	0.35
K Kaunda	0.57	0.99	178.95	117.32	33.36	42.69	0.43	4.66	2.69	3.39

12.2 Resources in the public sector

The North West province had a total of 18 public hospitals distributed across the four district municipalities. There were 3 412 hospital beds, 627 surgical beds and 46 operating theatres in the public sector. There were 22 registered specialist general surgeons, of which 14 (63.6%) were working in the public sector. There were an estimated 107 non-specialist surgeons performing common general surgical procedures in the North West. Table 114 demonstrates all public hospital data for each hospital by district _ (Appendix N).

12.2.1 Hospitals and total beds in the public sector

There were a similar number of public hospitals in all of the districts. However, Dr Ruth Segomotsi Mompati District had the largest number of hospitals per population (1.06 per 100 000). (Table 115). Dr Kenneth Kaunda District municipality had the largest number of public hospital beds (n=1 266) as well as number of hospital beds per population (178.95 per 100 000).

Table 115: North West public hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Bonjala	1 565 474	4	0.26	721	46.06
K Kaunda	707 479	4	0.57	1 266	178.95
N M Molema	852 654	5	0.59	869	101.92
R S Mompati	472 023	5	1.06	556	117.79

Table 116 demonstrates current data compared with that of 2007 HST data. There was a decrease in the number of district facilities from 2007 in most districts, however there was an increase in the regional hospital number. This could be explained by the upgrading of one of its facilities from a district to regional hospital. There was a significant decrease in bed number of about 2 000 beds during the seven year period. Table 116. (Figures 45 and 46 _ Appendix N).

Table 116: North West public hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	District 2007	District 2014	Regional 2007	Regional 2014	Central 2007	Central 2014	Public beds 2007	Public beds 2014
Bonjala Platinum	5	3	1	1	0	0	1 259	721
Dr R S Mompati (Bophirima)	6	4	0	1	0	0	614	556
Ngaka Modiri Molema (Central)	5	4	1	1	0	0	1 295	869
Dr K Kaunda (Southern)	2	2	2	2	0	0	2 373	1 266
Total	18	13	4	5	0	0	5 541	3 412

12.2.2 Surgical beds in the public sector

Dr Kenneth Kaunda District had the largest absolute number of surgical beds (n=236), as well as largest number of surgical beds per population (33.36 per 100 000). (Table 117). RS Mompati had the fewest surgical beds (n=82), but Bonjala Platinum District had far fewer surgical beds per population (6.32 per 100 000).

Table 117: North West public hospital surgical beds.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000
Bonjala Platinum	1 565 474	99	6.32
K Kaunda	707 479	236	33.36
N M Molema	852 654	210	24.62
R S Mompati	472 023	82	17.34

12.2.3 Number of general surgeons and operating theatres in the public sector

The North West Province had a similar number of specialist general surgeons in all districts however, the largest number of specialist general surgeons per 100 000 were in RS Mompati (1.06 per 100 000). There were a reasonable number of non-specialist general surgeons in almost all of the districts. Table 118. (Figure 47 _ Appendix N). There were 2.69 operating theatres per 100 000 in K Kaunda, with 19 of the 46 total operating theatres being located in this district. The remaining three districts each had nine operating theatres, however Bonjala Platinum District had the fewest operating theatres per population (0.57 per 100 000).

Table 118: North West public hospital general surgeons and operating theatres per 100 000 by region.

Region	Population (2014)	Specialist general surgeons	Specialist general surgeons per 100 000	Non-specialist surgeons	Non-specialist surgeons per 100 000	Operating theatres	Operating theatres per 100 000
Bonjala	1 565 474	4	0.26	32	2.04	9	0.57
K Kaunda	707 479	3	0.43	33	4.66	19	2.69
N M Molema	852 654	2	0.24	24	2.81	9	1.06
R S Mompati	472 023	5	1.06	18	3.81	9	1.90

12.3 Resources in the private sector

There were 14 private hospitals in the North West, with a total of 1 465 usable hospital beds in the four district municipalities. There were 576 surgical beds and 45 functional operating theatres. (Table 119 _ Appendix N).

12.3.1 Hospitals and total beds in the private sector

Dr Kenneth Kaunda District had the largest number of private hospitals (n=7), as well as hospitals per population (0.99 per 100 000). There were far more hospital beds than in the other districts (n=830), resulting in 117.32 hospital beds per 100 000. (Table 120).

Table 120: North West private hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Bonjala	1 565 474	5	0.31	498	31.81
K Kaunda	707 479	7	0.99	830	117.32
N M Molema	852 654	1	0.12	93	10.91
R S Mompati	472 023	1	0.21	44	9.32

A comparison between current data and 2007 HST data showed that the number of private hospitals have remained static but there was an increase of about 400 beds over the 7 year period. (Table 121, Figures 48 and 49 _ Appendix N). The number of beds in Kenneth Kaunda district have nearly doubled since 2007.

12.3.2 Number of surgical beds and operating theatres in the private sector

The largest number of private surgical beds (n=302), surgical beds per population (42.69 per 100 000) and operating theatres per population (3.39 per 100 000) were in Dr Kenneth Kaunda District municipality. (Table 122).

Table 122: North West private hospital surgical beds and operating theatres per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000	Operating theatres	Operating theatres per 100 000
Bonjala	1 565 474	221	4.11	16	1.02
K Kaunda	707 479	302	42.69	24	3.39
N M Molema	852 654	45	5.28	3	0.35
R S Mompati	472 023	8	1.70	2	0.42

13.1 Western Cape Provincial Results

The Western Cape, with approximately six million people, contains 11% of the South African population. The average medical aid coverage of 25.5% is the second highest in the country, but the intra-provincial variation in cover ranged from 12.7% in the Central Karoo, to 29% in the West Coast. [64]

Map 26: District Municipality map of the Western Cape. [12]

Cape Winelands District:

Cape Winelands District is located in the western interior of the Western Cape. The district consists of five sub-districts; Witzenberg, Drakenstein, Stellenbosch, Breede Valley and Langeberg. The district had an estimated medical aid coverage of 25.2% and fell into SEQ 5, which made it amongst the wealthiest districts. [64] There were four district and two regional hospitals (0.74 per 100 000), with 827 beds (102.35 per 100 000), 156 surgical beds (19.31 per 100 000) and 16 operating theatres (1.98 per 100 000). There were five specialist general surgeons (0.62 per 100 000) and 27 non-specialist surgeons (3.34 per 100 000), working in the public sector. There were four private hospitals (0.5 per 100 000), with 465 beds (57.54 per 100 000), 160 surgical beds (19.80 per 100 000), and 17 private operating theatres (2.10 per 100 000).

Central Karoo District:

The Central Karoo District comprises three sub-districts; Laingsburg, Prince Albert and Beaufort West. The district had a population of 71 232, which was the smallest in the country by a large margin. The district fell into SEQ 4 and was amongst wealthiest districts, with an estimated medical aid coverage of 12.7%. [64] There were four district hospitals (5.62 per 100 000), with 120 beds (168.46 per 100 000), 11 surgical beds (15.44 per 100 000) and four operating theatres (5.61 per 100 000). There were seven non-specialist surgeons (9.83 per 100 000), and no specialist general surgeons working in the public sector. There were no private hospitals in the district.

Cape Town Metro:

The Cape Town Metropolitan District is situated in the southern peninsula of the Western Cape. The metro included over 63% of the provincial population and influenced provincial indicators more than the other five districts. The Metro incorporates eight sub-districts; Eastern, Western, Northern, Southern, Khayelitsha, Klipfontein, Tygerberg and Mitchells Plain. The district had an estimated medical aid coverage of 27.1% and fell into SEQ 5, which placed it amongst the wealthiest districts. [64] There were eight district, one regional and three central hospitals (0.31 per 100 000), with 4 144 public sector hospital beds (107.34 per 100 000), 821 surgical beds (21.27 per 100 000) and 70 operating theatres (1.81 per 100 000). There were 65 specialist general surgeons (1.68 per 100 000) and 107 non-specialist general surgeons (2.77 per 100 000) working in the public sector, this was the second highest in the country after Johannesburg. There were 21 private hospitals (0.54 per 100 000), with 3 324 beds (86.10 per 100 000), 1 199 surgical beds (31.06 per 100 000) and 130 operating theatres (3.37 per 100 000).

Eden District:

Eden District is the second largest district in the Western Cape. The district municipality incorporates seven sub-districts; George, Mossel Bay, Knysna, Bitou (Plettenberg Bay), Oudtshoorn, Hessequa and Kannaland. The district had an estimated medical aid coverage of 17.2% and fell into SEQ 4. Eden is one of the 11 NHI pilot districts. [64] There were six district and one regional hospital (1.20 per 100 000), with 664 public sector hospital beds (113.34 per 100 000), 104 surgical beds (17.75 per 100 000) and 16 operating theatres (2.73 per 100 000). There were six specialist general surgeons (1.02 per 100 000) and 52 non-specialist surgeons (8.88 per 100 000) working in the public sector. There were seven private hospitals (1.19 per 100 000), with 438 beds (74.76 per 100 000), 163 surgical beds (27.82 per 100 000) and 17 operating theatres (2.90 per 100 000).

Overberg District:

Overberg District has four sub-districts; Overstrand, Theewaterskloof, Swellendam and Cape Agulhas. The district fell into SEQ 5, which was amongst the wealthiest districts and had an estimated medical aid coverage of 20.3%. [64] There were four district hospitals (1.65 per 100 000), with 202 public sector hospital beds (74.10 per 100 000), 23 surgical beds (8.44 per 100 000) and five operating theatres (1.83 per 100 000). There were 25 non-specialist surgeons (9.17 per 100 000) and no specialist general surgeons working in the public sector. There was one private hospital (0.41 per 100 000), with 104 beds (38.15 per 100 000), 26 surgical beds (9.54 per 100 000) and five operating theatres (1.83 per 100 000).

West Coast District:

The West Coast District comprises five sub-districts; Swartland, Bergrivier, Matzikama, Cederberg and Saldanha Bay. The district fell into SEQ 5 and has an estimated medical aid coverage of 29.0%. [64] There were seven district hospitals (1.67 per 100 000), with 369 public sector hospital beds (88.15 per 100 000), 59 surgical beds (14.09 per 100 000) and eight operating theatres (1.91 per 100 000). There was one specialist general surgeon (0.24 per 100 000) and 18 non-specialist general surgeons (4.30 per 100 000), who were working in public hospitals. There was one private hospital (0.24 per 100 000), with 60 hospital beds (14.33 per 100 000), 12 surgical beds (2.87 per 100 000), and two operating theatres (0.48 per 100 000).

Tables 123 and 124 demonstrate the total number of surgical resources, and the surgical resources per 100 000 in the Western Cape.

Table 123: Western Cape surgical resource numbers by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Winelands	6	4	827	465	156	160	5	27	16	17
Central Karoo	4	0	120	0	11	0	0	7	4	0
Cape town	12	21	4 144	3 324	821	1 199	65	107	70	130
Eden	7	7	664	438	104	163	6	52	16	17
Overberg	4	1	202	104	23	26	0	25	5	5
West Coast	7	1	369	60	59	12	1	18	8	2

Table 124: Western Cape surgical resources per 100 000 population, by district.

District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	Specialist general surgeons working in public hospitals	Non-specialist general surgeons working in public hospitals	Public operating theatres	Private operating theatres
Winelands	0.74	0.50	102.35	57.54	19.31	19.80	0.62	3.34	1.98	2.10
Central Karoo	5.62	0	168.46	0	15.44	0	0	9.83	5.61	0
Cape town	0.31	0.54	107.34	86.10	21.27	31.06	1.68	2.77	1.81	3.37
Eden	1.20	1.19	113.34	74.76	17.75	27.82	1.02	8.88	2.73	2.90
Overberg	1.65	0.41	74.10	38.15	8.44	9.54	0	9.17	1.83	1.83
West Coast	1.67	0.24	88.15	14.33	14.09	2.87	0.24	4.30	1.91	0.48

13.2 Resources in the public sector

The Western Cape had a total of 40 public hospitals distributed across the six district municipalities. There were 6 326 total hospital beds, 1 174 surgical beds and 136 operating theatres in the public sector. There were 209 registered specialist general surgeons, of which 77 (36.8%) were working in the public sector. There were 256 non-specialist surgeons performing common general surgical procedures in the Western Cape. Table 125 demonstrates all public hospital data for each hospital by district _ (Appendix O).

13.2.1 Hospitals and total beds in the public sector

The largest number of public hospitals were concentrated in the Cape Town metropole (n=12) however there were 0.31 public hospitals per 100 000. In contrast the Central Karoo had fewer hospitals (n=4), but more hospitals per population (5.62 per 100 000). (Table 126). Similarly, there were more hospital beds in Cape Town (n=4 144) compared to the Karoo (n=120), but the Karoo had a larger number of hospital beds per population.

Table 126: Western Cape public hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Cape Town	3 860 589	12	0.31	4 144	107.34
Winelands	808 042	6	0.74	827	102.35
Central Karoo	71 232	4	5.62	120	168.46
Eden	585 833	7	1.20	664	113.34
Overberg	272 624	4	1.65	202	74.10
West Coast	418 608	7	1.67	369	88.15

Table 127 demonstrates the current data compared with that of 2007 HST data. There was a decrease in the number of regional hospitals, largely in the Cape Town metropole (from five to one hospital), which corresponded with an increase in the number of district level hospitals (from three to eight). This could be explained by the downgrading of some facilities. There was a large decrease of about 3 500 hospital beds, which largely affected Cape Town (Figure 50 and 51 _ Appendix O).

Table 127: Western Cape public hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	District 2007	District 2014	Regional 2007	Regional 2014	Central 2007	Central 2014	Public beds 2007	Public beds 2014
Winelands	4	4	2	2	0	0	1 051	827
Central Karoo	4	4	0	0	0	0	196	120
Cape town	3	8	5	1	3	3	7 264	4 144
Eden	6	6	1	1	0	0	709	664
Overberg	4	4	0	0	0	0	193	202
West Coast	7	7	0	0	0	0	404	369
Total	28	33	8	4	3	3	9 817	6 326

13.2.2 Surgical beds in the public sector

Cape Town had the largest absolute number of general surgical beds (n=821), as well as largest number of surgical beds per population (21.27 per 100 000). (Table 128). The Overberg region had the fewest number of surgical beds per population (8.44 per 100 000) due to the fact that the district comprised of district level hospitals which had few surgical beds.

Table 128: Western Cape public hospital surgical beds per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000
Cape Town	3 860 589	821	21.27
Winelands	808 042	156	19.31
Central Karoo	71 232	11	15.44
Eden	585 833	104	17.75
Overberg	272 624	23	8.44
West Coast	418 608	59	14.09

13.2.3 Number of general surgeons and operating theatres in the public sector

Cape Town Metropolitan metropole had the largest number of specialist general surgeons, located mainly at the Tygerberg and Groote Schuur hospitals (Central hospitals). Although Red Cross War Memorial Children's hospital was a Central hospital, there were mostly paediatric specialist surgeons who have not been included in the overall surgeon number. This resulted in 1.68 specialist general surgeons per 100 000, working in the public sector in Cape Town. The Central Karoo and Overberg Districts had no specialist general surgeons working in public hospitals and very few working in the West Coast region (n=1). There were a reasonable number of non-specialist general surgeons in almost all of the district municipalities. The Central Karoo, Overberg and Eden districts had the highest number of non-specialist general surgeons per 100 000 in the country. Table 129. (Figure 52 _ Appendix O).

Table 129: Western Cape public hospital general surgeons and operating theatres per 100 000 by region.

Region	Population (2014)	Specialist general surgeons	Specialist general surgeons per 100 000	Non-specialist surgeons	Non-specialist surgeons per 100 000	Operating theatres	Operating theatres per 100 000
Cape Town	3 860 589	65	1.68	107	2.77	70	1.81
Winelands	808 042	5	0.62	27	3.34	16	1.98
Central Karoo	71 232	0	0	7	9.83	4	5.61
Eden	585 833	6	1.02	52	8.88	16	2.73
Overberg	272 624	0	0	25	9.17	5	1.83
West Coast	418 608	1	0.24	18	4.30	8	1.91

There were 136 functional operating theatres in the public sector, with 70 of them located in Cape Town. The Central Karoo had four operating theatres (5.61 theatres per 100 000), which was far more than the other districts. (Table 129).

13.3 Resources in the private sector

There were 34 private hospitals, with a total of 4 391 hospital beds in five of the six district municipalities. There were 1 560 surgical beds and 171 operating theatres. (Table 130 _ Appendix O).

13.3.1 Hospitals and total beds in the private sector

Cape Town and the Eden districts had the largest number of private hospitals, with 21 and four respectively. The Eden district had the largest number of private hospitals per population (1.19 per 100 000), whereas the Central Karoo had no private hospitals. (Table 131). Cape Town and Eden Districts had the largest number of private hospital beds per population (86.10 beds per 100 000 in Cape Town, and 74.76 per 100 000 in the Eden District).

Table 131: Western Cape private hospitals and total hospital beds per 100 000 by region.

Region	Population (2014)	Total hospitals	Total hospitals per 100 000	Total hospital beds	Total hospital beds per 100 000
Cape Town	3 860 589	21	0.54	3 324	86.10
Winelands	808 042	4	0.50	465	57.54
Central Karoo	71 232	0	0	0	0
Eden	585 833	7	1.19	438	74.76
Overberg	272 624	1	0.41	104	38.15
West Coast	418 608	1	0.24	60	14.33

Comparative data showed a large decrease in the number of private hospitals, which occurred predominately in Cape Town. There was a slight increase in the number of private hospital beds (4 111 to 4 391 beds). (Table 132, Figures 53 and 54 _ Appendix O).

13.3.2 Number of surgical beds and operating theatres in the private sector

The largest number of surgical beds and surgical beds per population were in Cape Town (n=1 199 and 31.06 per 100 000). Cape Town had 130 of the 171 private operating theatres, which translated into 3.37 private operating theatres per 100 000. (Table 133).

Table 133: Western Cape private hospital surgical beds and operating theatres per 100 000 by region.

Region	Population (2014)	Surgical beds	Surgical beds per 100 000	Operating theatres	Operating theatres per 100 000
Cape Town	3 860 589	1 199	31.06	130	3.37
Winelands	808 042	160	19.80	17	2.10
Central Karoo	71 232	0	0	0	0
Eden	585 833	163	27.82	17	2.90
Overberg	272 624	26	9.54	5	1.83
West Coast	418 608	12	2.87	2	0.48

Chapter 14: Private Hospitals

14.1 Number of hospitals

There were 217 private hospitals in South Africa. Table 134 demonstrates that the Netcare Group (n=50), Life hospital group (n=50) and Mediclinic (n=48), as well as the Independent hospital group (n=48) own the majority of private hospitals. Netcare and Life owned the majority of hospitals in Gauteng, whereas Mediclinic were the biggest group in the Western Cape. (Figure 55 _ Appendix P).

Table 134: Private hospitals according to province and hospital group.

Hospital group	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
Mining	0	1	1	0	0	2	0	2	0	6
Independents	1	7	17	10	1	2	1	5	4	48
Mediclinic	0	3	10	4	4	5	3	2	17	48
Lenmed Health	0	0	3	1	0	0	0	0	0	4
Life Healthcare	9	1	20	7	1	3	0	3	6	50
Netcare Limited	4	4	28	9	0	0	0	1	4	50
Melomed	0	0	0	0	0	0	0	0	3	3
Clinix Health Group	0	0	6	0	1	0	0	1	0	8
Total	14	16	85	31	7	12	4	14	34	217

14.2 Number of hospital beds

There were 31 312 private hospital beds in South Africa. The largest proportion of these were found in Gauteng (n=14 326), KwaZulu-Natal (n=4 802) and the Western Cape (n=4 391). According to comparative data, there was a 21% increase in the number of hospital beds between 2006 and 2010. Thereafter the bed number remained stable with only a moderate increase of about 250 beds between 2010 and 2014. Limpopo and the Northern Cape experienced decreases in the number of hospital beds. (Table 135).

Table 135: Comparison between private hospital bed number for 2006 (HASA), 2007 (HST), 2010 (Stats SA) and 2014.

Province	2006 private hospital beds (HASA)	2007 private hospital beds (HST)	2010 private hospital beds (Stats SA)	2014 private hospital beds
EC	1 365	1 488	1 723	1 684
FS	2 443	2 094	2 337	2 325
GP	12 909	14 157	14 278	14 326
KZN	3 402	3 752	4 514	4 802
LP	655	359	600	576
MP	928	923	1252	1 382
NC	992	325	293	361
NW	670	1 039	1 685	1 465
WC	4 268	4 111	4 385	4 391
RSA	27 632	28 248	31 067	31 312

Table 136 demonstrates the number of private hospital beds according to ownership by hospital group. Netcare owned the largest number of private hospital beds (n=8 800), with most of these being found in Gauteng. Life Healthcare had 7 561 beds, also with the largest number in Gauteng (n=3 262), followed by Kwazulu-Natal (n=1 376) and the Eastern Cape (n=1 131). Mediclinic had 7 032 beds, with the majority of hospital beds located in the Western Cape (n=2 442) and in Gauteng (n=1 920). The Independent and privately owned hospitals had 4 619 hospital beds, with the majority located in Gauteng and KwaZulu-Natal. (Figure 56 _ Appendix P).

Table 136: Private hospital beds according to hospital group.

Hospital group	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
Mining	0	150	294	0	0	238	0	331	0	1 013
Independents	31	935	1 915	1 168	22	106	34	322	86	4 619
Mediclinic	0	675	1 920	423	409	629	327	207	2 442	7 032
Lenmed Health	0	0	292	105	0	0	0	0	0	397
Life Healthcare	1 131	235	3 262	1 376	83	409	0	349	716	7 561
Netcare Ltd.	522	330	5 296	1 730	0	0	0	163	759	8 800
Melomed	0	0	0	0	0	0	0	0	388	388
Clinix Group	0	0	1 347	0	62	0	0	93	0	1 502
Total	1 684	2 325	14 326	4 802	576	1 382	361	1 465	4 391	31 312

14.3 Number of surgical beds

There were 10 578 general surgical beds in the private sector. These beds were specifically allocated to general surgery and excluded medical, paediatric and intensive care beds. The largest number of surgical beds were located in Gauteng (n=4 837), the Western Cape (n=1 560) and KwaZulu-Natal (n=1 449). Mpumalanga had the fewest number of surgical beds as a proportion of total bed number in the province (29.3%), and the Eastern Cape and North West provinces had the largest proportion (39.3% respectively). Table 137. (Figure 57 _ Appendix P). Private hospitals allocated approximately one third of the total beds to surgical patients, whereas public hospitals had 15-26% of their beds allocated to general surgical patients.

Table 137: Private hospital surgical beds as a proportion of total hospital beds.

Province	Total hospital beds	Surgical beds	Surgical beds as a proportion of total hospital beds (%)
EC	1 684	663	39.3
FS	2 325	764	32.8
GP	14 326	4 837	33.7
KZN	4 802	1 449	30.2
LP	576	197	34.2
MP	1 382	406	29.3
NC	361	126	34.9
NW	1 465	576	39.3
WC	4 391	1 560	35.5
RSA	31 312	10 578	33.7

Table 138 _ (Appendix P) demonstrates private hospital surgical beds according to hospital group. The Netcare group had 3 274 surgical beds with 2 010 (61.4%) of them located in Gauteng. Life Healthcare had 2 551 surgical beds with 1 184 (46.4%) of them located in Gauteng. Mediclinic had 2 320 surgical beds with 936 (40.3%) of them located in the Western Cape and 492 (21.2%) in Gauteng. (Figure 58 _ Appendix P).

Table 139 demonstrates a comparative of surgical resources according to hospital group and includes surgical beds as a proportion of total bed number as well as the number of operating theatres. Netcare had the highest number of surgical beds as a proportion of total bed number (37.2%), and the Clinix health group has the lowest (19.2%).

Table 139: Private hospital comparative of surgical resources according to hospital group.

Hospital group	Hospital Number	Hospitals beds	Surgical Beds	Surgical beds as a proportion of totals beds (%)
Mining	5	1 013	338	33.4
Independents	48	4 619	1 552	24.9
Mediclinic	48	7 032	2 320	33.0
Life Healthcare	50	7 561	2 551	33.7
Netcare Ltd.	50	8 800	3 274	37.2
Melomed	3	388	120	30.9
Clinix	8	1502	289	19.2
Other	5	397	134	33.7
Total	217	31 312	10 578	33.8

14.4 Number of operating theatres

There were 1 070 operating theatres in the private sector, of which 500 (46.72%) were located in Gauteng, 171 (15.88%) in the Western Cape and 162 (15.14%) in KwaZulu-Natal. Table 140 demonstrates the distribution of operating theatres according to province. There were 322 (30%) in the Netcare group, 286 (26.7%) in the Life Healthcare group, and 244 (22.8%) in the Mediclinic group. (Table 141 and Figure 59 _ Appendix P).

Table 140: Private hospital operating theatres according to province.

Province	Number of operating theatres	Proportion of total theatres (%)
EC	63	5.89
FS	60	5.60
GP	500	46.72
KZN	162	15.14
LP	18	1.68
MP	39	3.64
NC	12	1.21
NW	45	4.20
WC	171	15.88
RSA	1 070	100

14.5 Surgical resource trends

The overall hospital number remained the same despite a decrease in the number of hospitals owned by the Life Healthcare group, which decreased from 56 to 50 facilities and those owned by the Independent group, which decreased from 54 to 48 facilities. This was offset by an increase in the number of hospitals owned by Mediclinic, which increased from 44 to 48, those owned by Netcare, which increased from 42 to 50, and those owned by Clinix, which increased from 4 to 8. (Table 142 and Figure 60).

Table 142: Comparison of surgical resources according to ownership (2006 and 2014).

Owner	Hospitals (2006)	Hospitals (2014)	Total beds (2006)	Total beds (2014)	Surgical beds (2006)	Surgical beds (2014)	Theatres (2006)	Theatres (2014)
Mining	6	5	1 470	1 013	563	338	16	13
Independents	54	48	3 417	4 619	837	1 552	125	157
Mediclinic	44	48	6 401	7 032	2 509	2 320	234	244
Life	56	50	7 300	7 561	2 394	2 551	257	286
Netcare Ltd.	42	50	7 302	8 800	2 943	3 274	276	322
Melomed	3	3	351	388	86	120	12	10
Clinix	4	8	511	1502	106	289	10	26
Other	7	5	834	397	254	134	38	12
Total	216	217	27 586	31 312	9 692	10 578	968	1 070

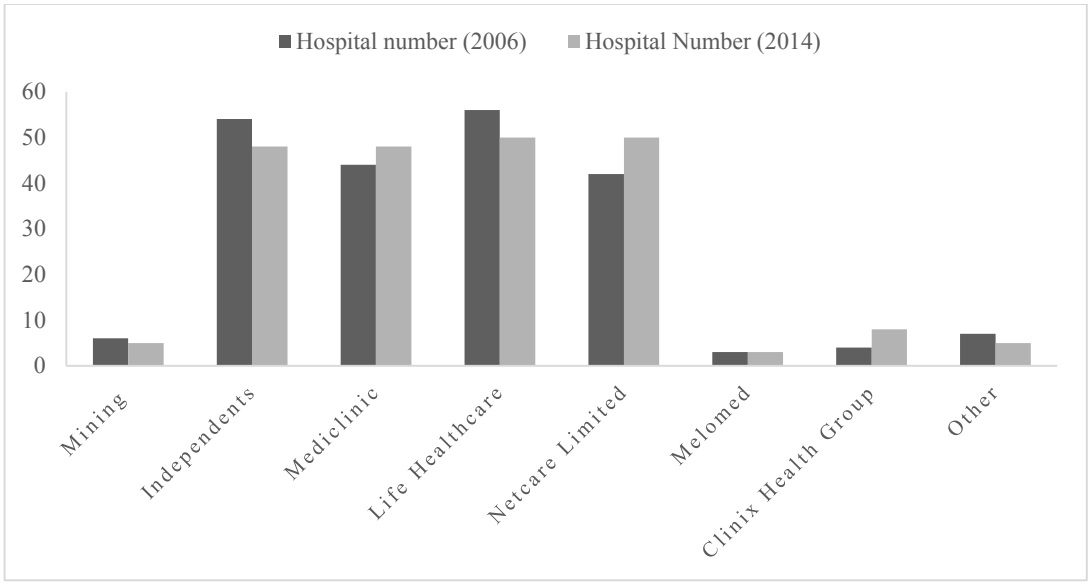


Figure 60: Comparative between private hospital number for 2006 and 2014.

There was an overall increase in the number of private sector hospital beds, which increased from 27 586 to 31 312 beds. The majority of increases were experienced by Netcare, which increased its bed number by 1 500, Mediclinic by 600 beds and the Clinix group by about 500 beds. (Figure 61).

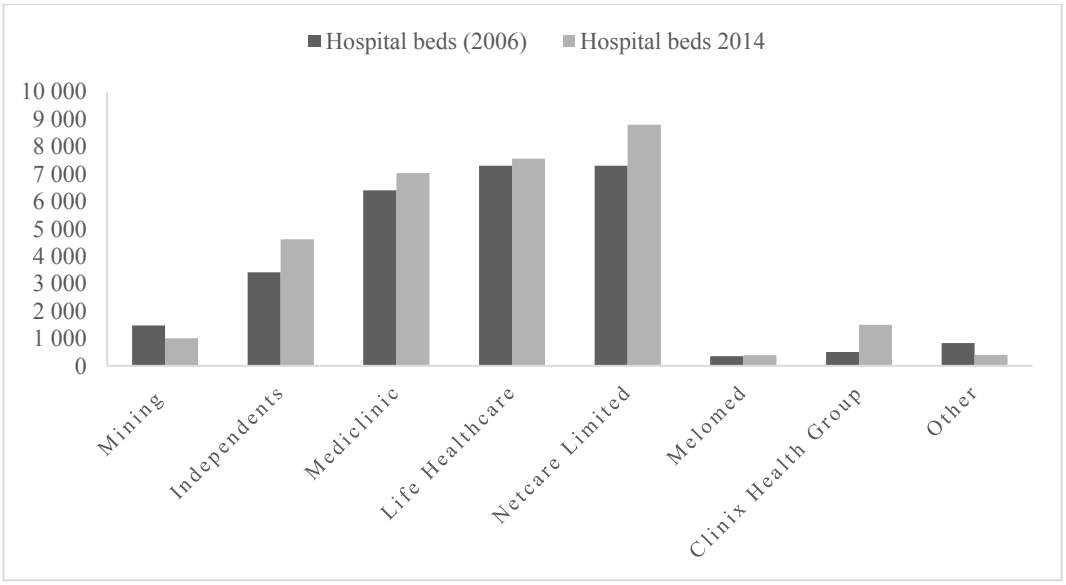


Figure 61: Comparative between private hospital bed number for 2006 and 2014.

The number of surgical beds increased from 9 692 to 10 578. The Clinix group and Independents experienced the largest increases in surgical bed numbers, with a smaller increase in the surgical beds owned by Netcare. (Figure 62).

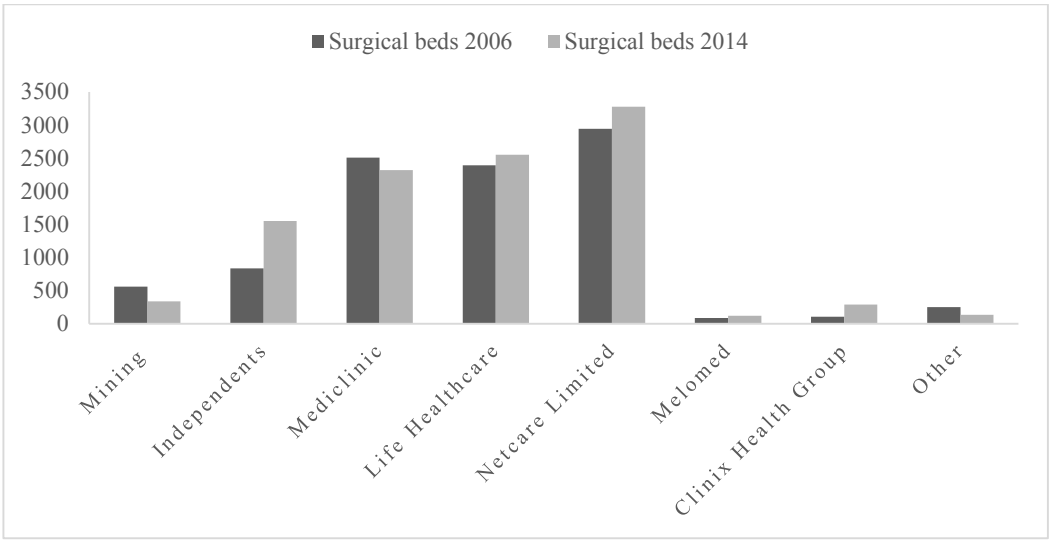


Figure 62: Comparative between private hospital surgical bed number for 2006 and 2014.

There was an increase in the number of private sector operating theatres, from 968 to 1 070. The largest increases in the Netcare group (276 to 322) and the Life healthcare group (257 to 286), as well as the Independent hospitals (125 to 157). (Figure 63).

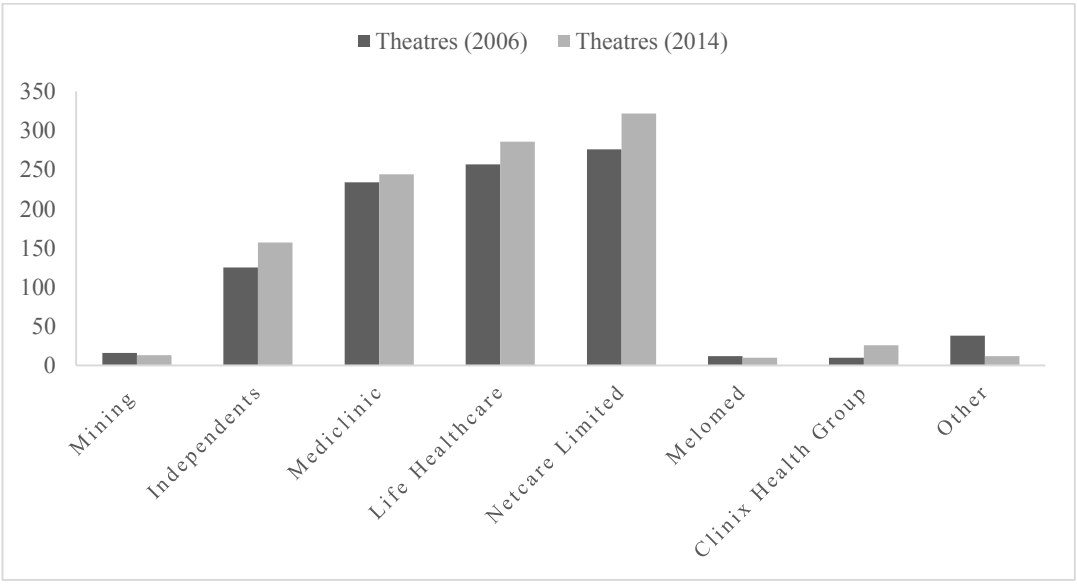


Figure 63: Comparative between private hospital theatre number for 2006 and 2014.

The table below (Table 143) illustrates the differences between public and private sector surgical resources. It was difficult to delineate how many specialist general surgeons were working in the private sector for reasons alluded to in previous chapters. Therefore the number of registered specialist surgeons in the provinces will be compared with the number of specialist general surgeons working in public hospitals, and by inference the difference should approximate to a certain extent with the number working in the private sector. There are however public sector surgeons who undertake private practice and therefore this number probably underestimates the true number of specialists working in the private sector.

Table 143: Public and private surgical resources by province.

Province	Public hospital	Private hospital	Public beds	Private beds	Public Surgical beds	Private surgical beds	Specialist General surgeons (Public)	Specialist general surgeons	Public theatres	Private theatres
EC	75	14	10 833	1 684	1 890	663	29	53	118	63
FS	30	16	3 717	2 325	619	764	14	60	65	60
GP	26	85	14 855	14 326	2 452	4 837	158	298	211	500
KZN	54	31	18 087	4 802	3 192	1 449	68	203	183	162
LP	37	7	7 241	576	1 080	197	6	16	63	18
MP	28	12	4 792	1 382	844	406	5	23	60	39
NC	17	4	1 654	361	292	126	5	10	17	12
NW	20	14	3 412	1 465	627	576	14	22	46	45
WC	40	34	6 236	4 391	1 174	1 560	77	209	136	171
RSA	327	217	70 917	31 312	12 170	10 578	376	894	899	1 070

15.1 Public versus private hospital number

There were 327 public hospitals and 217 private hospitals in South Africa. The rural provinces of the Eastern Cape, Limpopo, Mpumalanga and Northern Cape had far fewer private hospitals than public hospitals as depicted below. Gauteng province had three times as many private than public hospitals. (Figure 64).

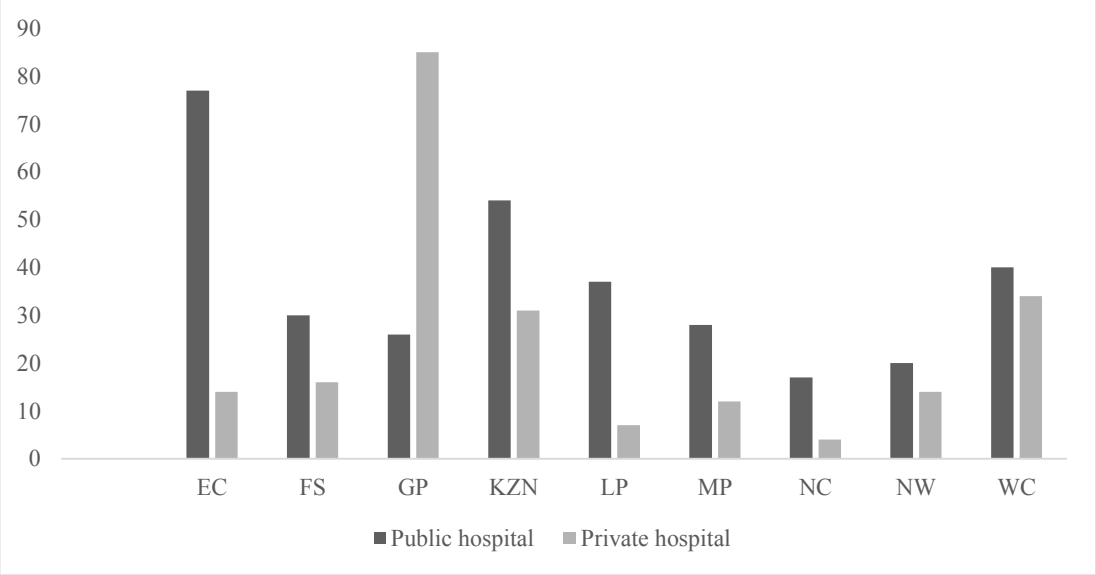


Figure 64: Public and private sector hospitals per province.

15.2 Public versus private hospital bed number

There were 31 312 private hospital beds and more than twice as many (n=70 917) public hospital beds in South Africa. The obvious difference in total usable hospital bed number were seen in the Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga and Northern Cape which had far more public sector beds. Gauteng had almost an even number of public and private beds, as did the Western Cape. (Figure 65).

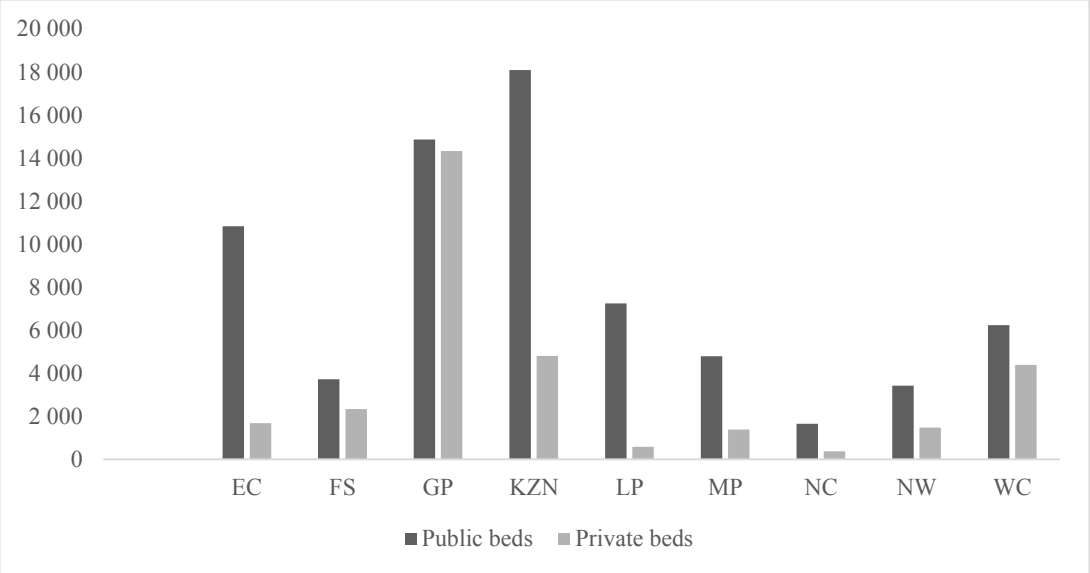


Figure 65: Public and private sector hospital beds per province.

15.3 Public versus private surgical bed number

There were 12 170 public hospital surgical beds and 10 578 private hospital surgical beds in South Africa. The surgical beds mirrored the total hospital bed distribution with the exception of Gauteng where private surgical beds were almost twice as numerous as the number of public surgical beds. (Figure 66).

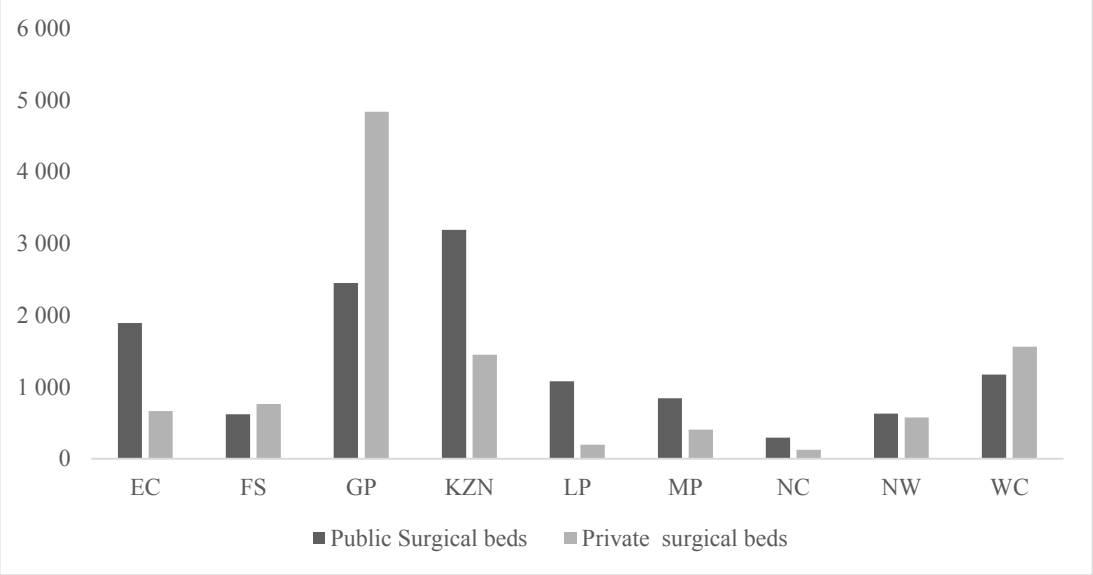


Figure 66: Public and private sector surgical beds per province.

15.4 Public versus private operating theatre number

There were 899 functional operating theatres in the public sector and 1 070 theatres in the private sector. Gauteng had the largest overall number with 711 theatres, with the majority of being in the private sector (n=500). The Eastern Cape had approximately half the number of private theatres than public theatres, and Limpopo had less than a third of those found in the private sector. The remaining provinces had a reasonably even distribution of functional operating theatres between the public and private sectors. (Figure 67).

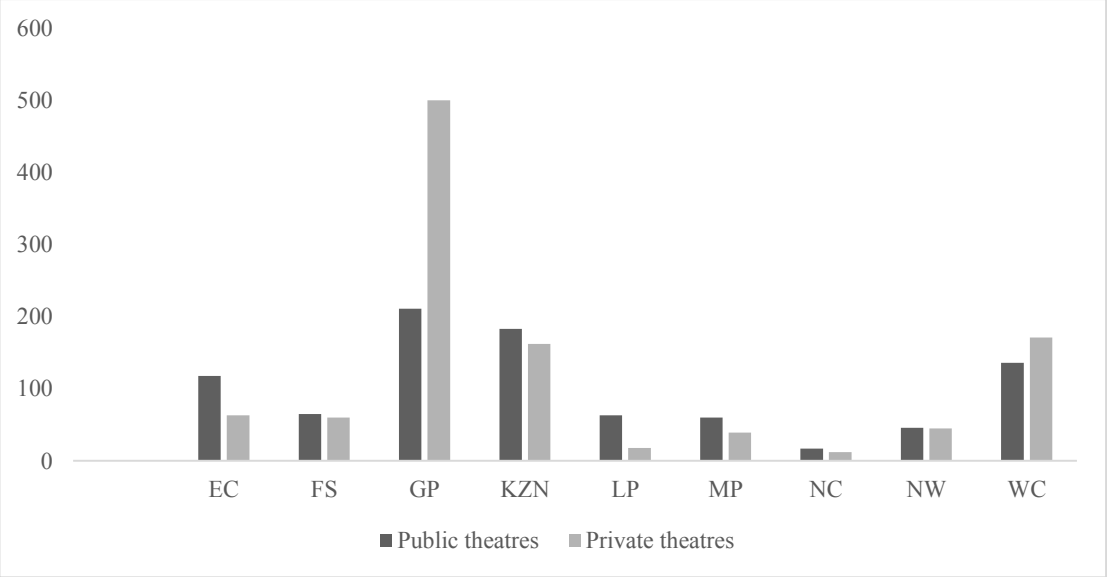


Figure 67: Public and private sector operating theatres per province.

15.5 Specialist general surgeons in the public and private sectors

There were 894 registered specialist general surgeons in 2014 and 376 (42%) of these were found to be working in public hospitals. Provinces such as Gauteng, the Northern Cape, the Eastern Cape and the North West Province had more than 50% of registered specialist general surgeons working in public hospitals. Mpumalanga and the Free State had the lowest proportion of registered general surgeons working in public practice with 21.7% and 23% respectively. (Figure 68).

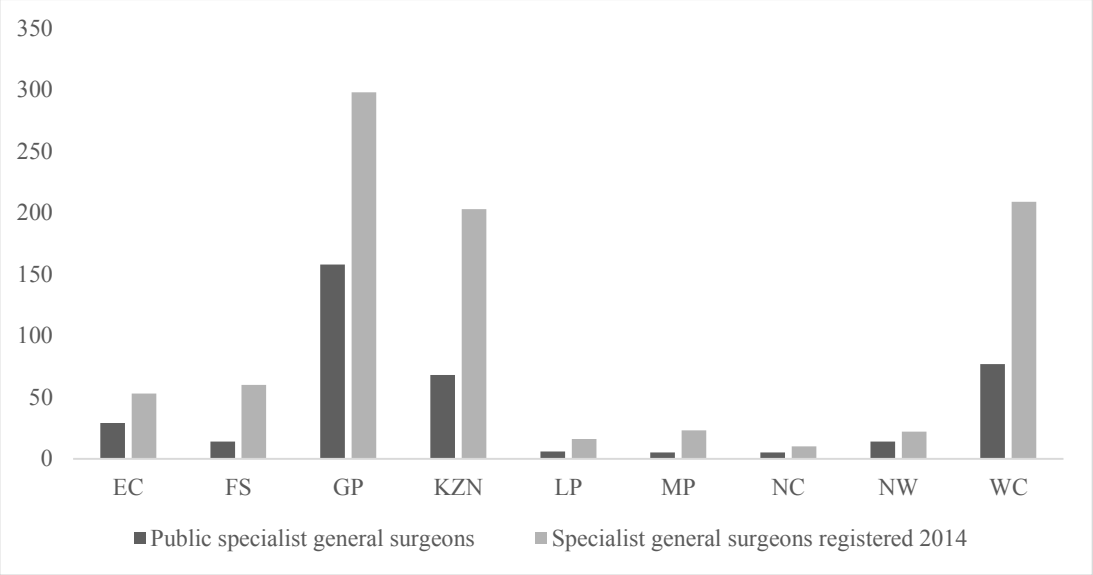


Figure 68: Registered specialist general surgeons and the proportion working in public hospitals.

15.6 Public and private surgical resources per 100 000

The table below demonstrates the differences between public and private sector resources per 100 000.

Table 144: Comparative of public and private surgical resources per 100 000.

Province	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	SP General surgeons	SP General surgeons in public hospitals	Public theatres	Private theatres
EC	1.11	0.20	159.61	24.81	27.84	9.77	0.78	0.43	1.74	0.93
FS	1.08	0.57	133.38	83.43	22.21	27.41	2.15	0.50	2.33	2.15
GP	0.20	0.65	115.02	110.92	18.98	37.45	2.30	1.22	1.63	3.87
KZN	0.50	0.29	169.12	44.90	29.85	13.55	1.89	0.64	1.71	1.51
LP	0.66	0.12	128.60	10.22	19.18	3.50	0.30	0.11	1.12	0.32
MP	0.56	0.24	95.85	27.64	16.88	8.12	0.46	0.10	1.20	3.34
NC	1.46	0.34	141.76	172.71	25.03	10.80	0.85	0.42	1.45	1.02
NW	0.54	0.38	92.81	39.85	17.06	32.72	0.60	0.38	1.25	1.22
WC	0.65	0.55	103.42	71.79	19.19	44.70	3.41	1.26	2.22	2.81
RSA	0.60	0.40	129.48	57.18	22.22	19.31	1.78	0.69	1.64	1.95

There were more public hospitals per 100 000 than private hospitals per 100 000 in South Africa. However, only 16% of the South African population had access to private healthcare. Notable differences were that in the rural provinces, private hospitals per population were far fewer then public hospitals per population. The Western Cape had a similar number of public and private hospitals per population. Gauteng was the only province with more private hospitals per population (0.65 per 100 000) than public hospitals per population (0.20 per 100 000).

The majority of provinces had fewer private hospital beds per population than public beds per population. The Eastern Cape, Limpopo, Mpumalanga, KwaZulu-Natal and North West provinces had notably far fewer private hospitals beds per population. The Northern Cape was the only province with more private hospital beds per population (172.71 per 100 000) than public hospital beds (141.76 per 100 000). Gauteng had a similar number of hospitals beds per 100 000 in both sectors.

Limpopo, Mpumalanga and the Eastern Cape had far fewer private surgical beds per population, with Limpopo having 3.50 surgical beds per 100 000. Gauteng, the Western Cape and North West provinces had twice has many private surgical beds per population than public surgical beds. In South Africa overall, private and public surgical beds per population were similar despite the individual provincial differences.

There were 1.95 private operating theatres per 100 000 compared with 1.64 public operating theatres per 100 000 in South Africa. The Western Cape, Mpumalanga and Gauteng had far more private operating theatres per population than public operating theatres. The Free State and the Western Cape had greater than two operating theatres per 100 000 in the public sector, whereas Mpumalanga and Gauteng had greater than three operating theatres per 100 000 in the private sector.

There were 1.78 specialist general surgeons per 100 000 in South Africa, and of these 0.69 per 100 000 worked in the public sector. The largest number of specialist surgeons per population were in the Western Cape (1.26 per 100 000) and Gauteng Provinces (1.22 per 100 000). Limpopo and Mpumalanga had the smallest surgeon number per population with approximately 0.10 per 100 000 respectively.

15.7 Inferential statistics: analysis of the proportions of surgical resources per 100 000

This section contains comparisons between all the variables for all the provinces expressed as values per 100 000. An equal distribution was accepted as the expected distribution (null hypothesis). Percentages were used for comparison. A p-value of less than 0.05 was used as statistically significant in order to reject the null hypothesis.

Table 145: Chi-squared test and probability values (p-value) for assessing differences in distribution of surgical resources across the provinces.

Null Hypothesis	Power divergence statistic Chi-squared test	P-value (<0.05)
There was an equal distribution of public hospitals per 100 000 in all provinces.	22.41	0.0042
There was an equal distribution of private hospitals per 100 000 in all provinces.	19.86	0.0108
There was an equal distribution of public hospital beds per 100 000 in all provinces.	3.50	0.8991
There was an equal distribution of private hospital beds per 100 000 in all provinces.	36.72	1.2916
There was an equal distribution of public surgical beds per 100 000 in all provinces.	3.63	0.8883
There was an equal distribution of private surgical beds per 100 000 in all provinces.	36.17	1.6316
There was an equal distribution of public theatres per 100 000 in all provinces.	4.56	0.8030
There was an equal distribution of private theatres per 100 000 in all provinces.	41.20	1.9075
There was an equal distribution of specialist general surgeons in the public sector per 100 000 in all provinces.	48.83	6.8489
There was an equal distribution of non-specialist general surgeons in the public sector per 100 000 in all provinces.	5.40	0.7139

There was an unequal distribution of public hospitals per 100 000 and of private hospitals per 100 000 in all the provinces. Despite the provincial differences in the remaining surgical resources for both public and private sectors, these were not statistically significant.

Chapter 16: Comparison of South Africa's surgical resources with International Countries

There was a global paucity of data when it came to surgical resources and therefore a comparison was limited due to the few number of countries which make these data available. South Africa is currently classified as an UMIC by the World Bank and therefore a comparison with other similarly ranked countries would make sense. The data below was taken from various sources, which included the World Bank. (Table 146).

Table 146: International comparison of surgical indicators per 100 000 population.

Country	World bank designation	Hospital beds per 100 000	General surgeons per 100 000	Theatres per 100 000
UK	HIC	294	30.5	14.7
USA	HIC	299	7.39	14.3
Australia	HIC	382	18.3	14.3
South Africa	UMIC	186	1.78	3.59
Brazil	UMIC	230	-	4.0
Botswana	UMIC	-	-	1.2
Angola	UMIC	-	-	1.0
Kenya	LMIC	140	0.55	1.1
Zambia	LMIC	190	0.36	1.2
Zimbabwe	LIC	170	0.46	1.2
Tanzania	LIC	70	0.26	1.1
Uganda	LIC	40	0.24	1.1
Malawi	LIC	130	0.16	0.98
Rwanda	LIC	160	0.16	1.1
Mozambique	LIC	70	0.14	3.1
Ethiopia	LIC	180	0.05	1.1

High income countries such as the UK, USA and Australia had the most beds, theatres and general surgeons. These countries were the richest in surgical resources. Low income countries such as Uganda and Tanzania had fewer than 100 hospital beds per 100 000, and South Africa and Brazil (UMICs), had nearly 200 hospital beds per 100 000. (Figure 69). Surgical beds are currently not used as a measure of surgical resources and no global data exist as a comparative for South Africa's 41.55 surgical beds per 100 000.

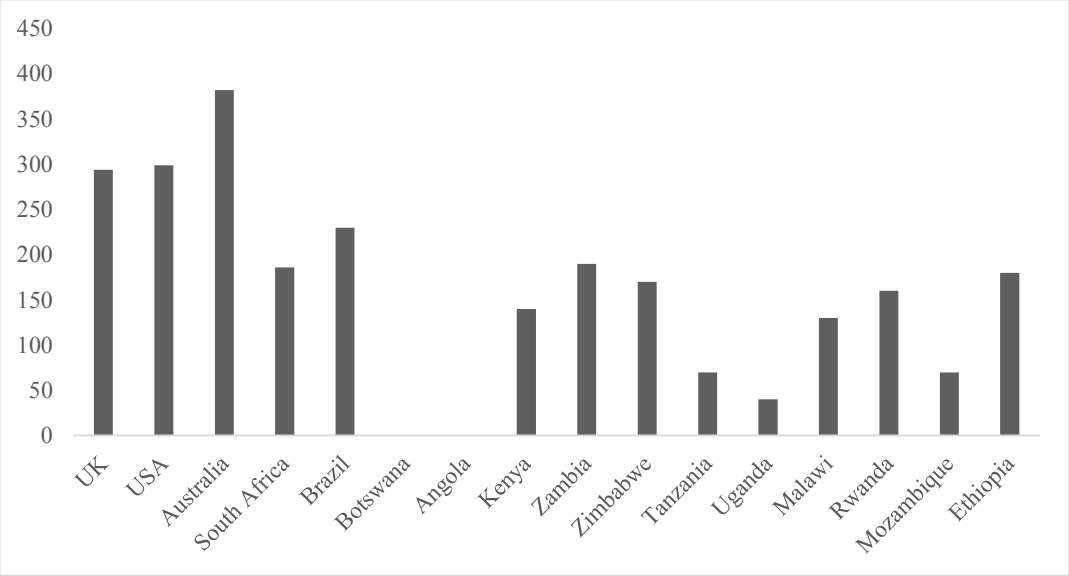


Figure 69: Global comparison of hospital beds per 100 000 population.

More work is needed regarding workforce mapping in order to determine the exact global distribution of surgeon number. High income countries, once again, had a wealth of human resources when it came to specialist general surgeons. Figure 70 shows absolute general surgeon number, and although incomplete, it represents the dearth of resources in developing countries. The UK had over 30 general surgeons per 100 000 compared with South Africa which had 1.78 per 100 000, most of whom were working in the private sector (nearly 60%).

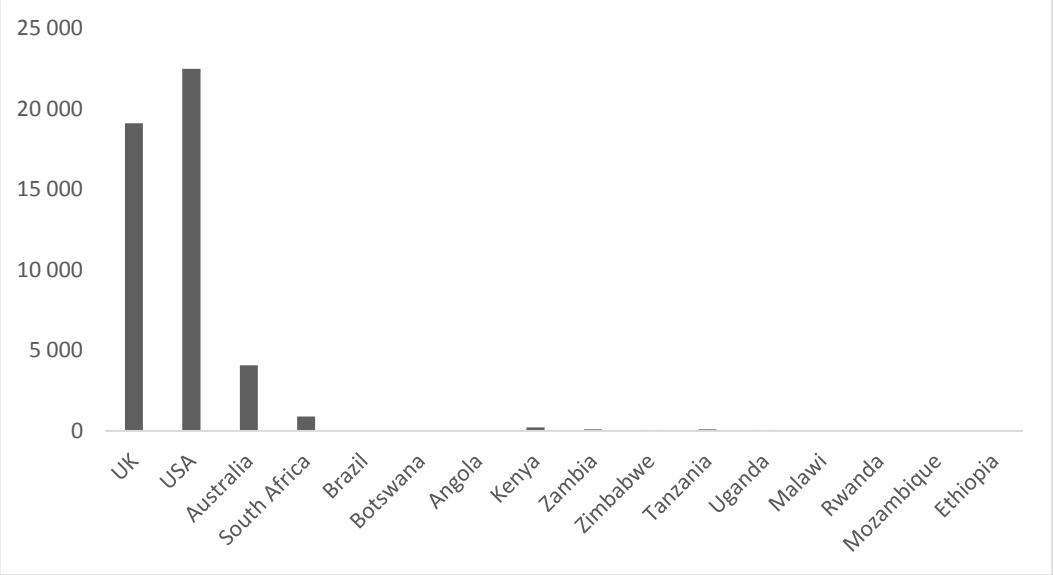


Figure 70: Global comparison of the number of general surgeons.

The distribution of operating theatres followed a similar pattern to other surgical resources. High income countries had upward of 14 operating theatres per 100 000, while UMICs such as South Africa and Brazil, had approximately four operating theatres per 100 000. Low income countries had one operating theatre per 100 000 people. (Figure 71).

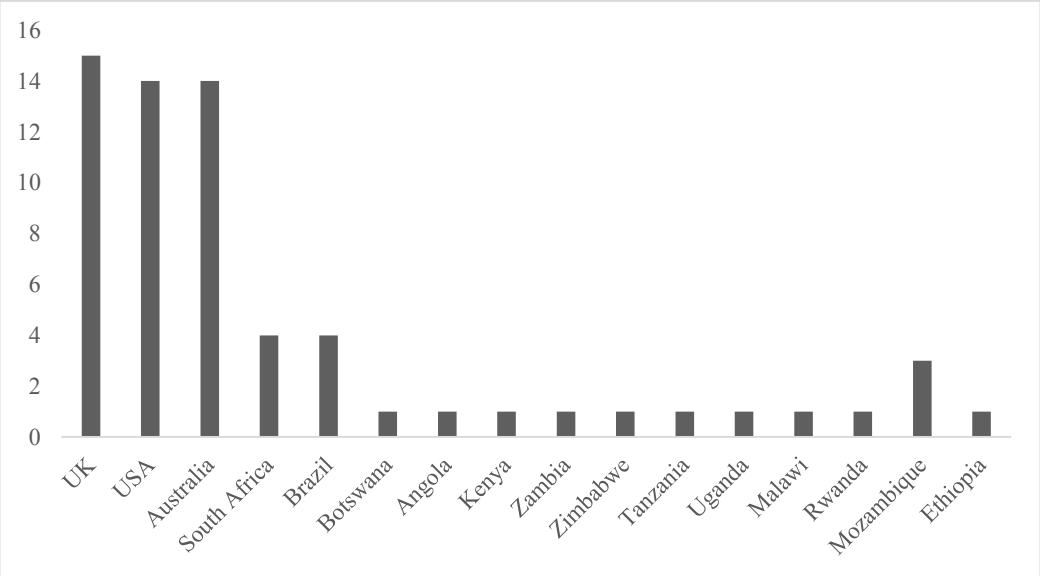


Figure 71: Global distribution of functional operating theatres per 100 000 population.

Chapter 17: Population Prediction and Deficit Calculations

South Africa had an estimated population of 54 million people in 2014 and assuming a steady growth of 1.6% per annum, this will grow to 70 million by 2030. [62] Table 147 illustrates the current state of surgical resources and the predicted deficits over next 15 years.

There was one hospital per 100 000 people in South Africa and currently there is no recommendation as to the optimum number needed to provide adequate surgical care. If the ratio was to remain the same, and the population increased to 70 million by 2030, then a further 154 hospitals would be needed.

There were 186.64 hospital beds per 100 000 in South Africa compared to high income countries which have around 290 beds per 100 000. The predicted bed deficit by 2030 would be 28 419 beds. In order to reach the resource level of high income countries such as the UK, over 100 000 additional hospital beds would be needed in the next 15 years. Alternatively, bed capacity could be optimized and increased in existing facilities. Most hospitals were allocated a certain hospital bed number, but only utilize a certain proportion of these due to budget and other resource constraints. The combination of public and private surgical beds resulted in 41.55 total surgical beds per 100 000. There was no published recommendation regarding the optimum surgical bed number to meet the surgical burden, perhaps because this is a poor indicator of surgical capacity. If the current ratio (41.55 per 100 000) was to remain the same, then an additional 6 327 surgical beds would be needed.

There were 1.78 registered specialist general surgeons per capita in South Africa in 2014. Various sources have made conflicting recommendations regarding the optimum surgeon number per population, but seems to be between five and seven general surgeons per 100 000. [72] This will result in a deficit of 352 surgeons by 2030. If the ideal ratio of five surgeons per 100 000 was to be achieved in the next 15 years, a further 2 600 specialist surgeons would be needed.

There were currently 3.59 operating theatres per 100 000 people. The physical space is of less consequence than all the components needed to make it functional; water, electricity, oxygen and surgical staff. If the current ratio (3.59 per 100 000) was to remain the same, then an additional 544 theatres would be needed by 2030 to provide the same surgical service, albeit below that of high income countries. When the first world ratio of 14 theatres per 100 000 was aimed for, there was a deficit of 7 800 operating theatres.

Table 147: Predicted surgical resource deficit for 2030.

Surgical Resource	Current ratio (per 100 000 population)	Ideal (WHO recommendation)	Deficit prediction for 2030 Absolute number needed for current ratio to remain constant	Deficit prediction for 2030 Absolute number needed to achieve ideal ratio
Hospitals	1.00	No recommendation	154	-
Hospital beds	186.64	290	28 419	100 770
Surgical beds	41.55	No recommendation	6 327	-
General surgeons	1.78	5	352	2 600
Theatres	3.59	14	544	7 800

Far more resources would be needed to support an adequate surgical infrastructure for a National Surgical Plan to be successful. In addition, clear recommendations are needed regarding optimum surgical resources which comprise far more than just theatres, beds and staff. Importantly, these metrics have limitations in their ability to predict surgical capacity and need to be evaluated in a broader context.

Chapter 18: Discussion, Conclusions and Recommendations

Surgically treatable diseases comprise upward of 30% of the burden of disease globally and an estimated five billion people do not have safe access to surgical care. These numbers are substantial and growing. Of the 243 million surgeries being performed each year, only 3.5% of these take place in lower and middle income countries. [9] The latter is associated with unacceptably high morbidity and mortality rates. Furthermore there is an overwhelming increase in the unmet need of surgical disease.

Unfortunately the human resources and infrastructure fall short of what is needed to provide surgical care in LMICs. The UN reported that for every US$1 spent on improving surgical capacity, US$10 are generated through improved productivity. [77] In addition to this, expansion of surgical capacity appeared to be most cost-effective at the district level. [31]

The current research provides part of an overview of the surgical infrastructure and workforce within general surgery for all hospitals in South Africa. It provides a framework onto which further data collection efforts can be structured and needs to be evaluated in conjunction with other metrics used to determine surgical capacity. Strengthening surgical systems will reduce the surgical burden of disease and improve health outcomes globally. With the involvement of various international organisations, policy makers, healthcare managers and stakeholders, a collaborative approach can be achieved in order to accelerate progress towards improved and sustainable surgical care. This would result in safer and more efficient surgical systems which would reduce morbidity and mortality.

This research was undertaken prior to the assessment using the Lancet Commission surgical indicators and the WHO Situational Analysis Tool, and therefore not all metrics correspond to each of these assessment tools. The LCoGS National Surgical Plan recommends that there are several infrastructure components which need to be reflected upon _ (Appendix C), and need to be expanded upon in the South African context.

Analysis of national results

The current study included 544 hospitals in South Africa. Specialized hospitals, such as psychiatric, rehabilitation, TB hospitals, maternity homes and old age institutions were excluded. There were 257 district level hospitals, 49 regional hospitals and 21 level three hospitals (8 national central and 12 provincial tertiary). The average district hospital had 131 beds, 20 surgical beds, 0.1 specialist general surgeons, three non-specialist general surgeons and one functional operating theatre. The average regional hospital had 471 beds, 86 surgical beds, two specialist general surgeons, five non-specialist general surgeons and five functional operating theatres. The average tertiary/central hospital had 762 beds, 144 surgical beds, 12 specialist general surgeons, 21 non-specialist general surgeons and 13 functional operating theatres. In comparison, Malawi, had 250 hospital beds and two theatres per district hospital, and 913 hospital beds and seven operating theatres per central hospital. [51] (Table 148 _ (Appendix Q).

The Eastern Cape (EC), surprisingly had the largest number of public hospitals, with nearly twice as many as KwaZulu-Natal (KZN), as well as the largest number of tertiary and central referral hospitals in the country. The Eastern Cape was reported to have no level three hospitals in the report published by the HST in 2006, and now has seven tertiary/national central hospitals. This could be attributed to attempts at health system strengthening and reducing inequalities of the past. This can be demonstrated through district health services expenditure and primary health care expenditure per capita which is higher in the EC than the WC. [64]

The EC, along with the NC had the largest number of public hospitals per population despite these provinces being perceived as rural and having the lowest socioeconomic quintiles (SEQ) in South Africa. The Northern Cape had 16 district level hospitals for a population of just over a million people. A question around cost-effectiveness should be posed. It should be emphasized that facility numbers do not translate into adequate service delivery.

Rural provinces, such as the EC, see migration of patients towards the urban provinces (such as the WC), in search of superior healthcare, despite having a larger number of hospitals. This demonstrates that resource number may not reflect acceptable levels of care and provinces with fewer hospitals may have higher patient volumes. Health inequalities were observed through mortality rates in the EC, KZN and the FS, where mortality rates were double that of the WC. [87] These data could explain why at the patient level, patients are choosing to migrate to areas where health outcomes seem to be better.

When improving a health system, the health inputs (money and resources), processes (of delivering care) and outcomes need to be addressed. [67] The inputs and processes interact to produce the health outcome and not just the provision of infrastructure and staff. *Systems thinking* is a far more comprehensive way in which health care provision needs to be viewed, as poor outcomes reflect a system failure. Whatever metric is used needs to be applied to measure the quality of the system. As mentioned, resources such as beds and hospital numbers do not equate to acceptable health outcomes and are poor surrogates used to assess whether resources are 'adequate'.

The national average of public hospitals per population was 0.60 per 100 000. Gauteng Province fell far below this average, with 0.20 per 100 000. Gauteng does however have 0.65 private hospitals per 100 000 (national average 0.40 per 100 000), which was the highest in the country. This result was not surprising as this province is by far the 'wealthiest' in terms of gross domestic product (GDP), which is valued at R811 billion (US$112 billion). Gauteng generates 33.9% of South Africa's GDP and an astonishing 10% of the total GDP of the entire African continent. [62] When the public and private facilities were combined, GP had 0.86 hospitals per 100 000, which was still below the national average of 1.00 per 100 000.

Well-resourced provinces see large numbers of patients accessing their health resources from other provinces. Despite the perception that the WC and GP were 'wealthy' and provide greater resources, they were often accessed by inhabitants of neighbouring provinces, thereby placing strain on their health-systems. By implication, simply looking at number of hospitals and beds does not translate into adequate healthcare or surgical provision as bed utilization rates are highest in these provinces. The WC experiences a bed utilization rate of 88.7, which is far higher than the national average of 68.3 compared with the EC, which has a bed utilization rate of 59.5 (the lowest on the country). [64] In addition, the WC reports an average length of stay in hospital to be 3.7 days, whereas the EC reports an average length of stay of 5.7 days. [64] This could be as a result of greater patient volumes in the WC, which may result in mandatory higher patient turnover as a result of 'bed pressure'. Assessing readmission rates to hospital could provide an indication as whether this higher turnover rate is resulting in poorer outcomes and increased expense as a result.

Tracking the migration patterns of patients may provide insight into their health-seeking behaviour. Migration is an important demographic process which shapes the distribution of the provincial population. [60] For the period 2011-2016, it is estimated that approximately 241 758 people migrated from the EC; Limpopo is estimated to experience an outflow of migrants of nearly 303 101 people. During the same period, Gauteng and the WC are estimated to experience an inflow of migrants of approximately 1 106 375 and 344 830 respectively. Mpumalanga and the North West Province also receive a positive net migration, whereas the Eastern Cape, Free State and Limpopo experience the largest outflow. [60] Understanding the ebb and flow of patients migrating between provinces in search of health care is critical and demonstrates that simply using infrastructure metrics such as hospital and bed numbers are limited in the information they provide policymakers about resource availability.

Hospital beds as resource indicators

The largest proportion of the 102 229 hospital beds were located in GP (28%), KZN (22%), EC (12%) and the WC (10%). Gauteng, the WC and KZN comprise large metropolitan areas, whereas the EC is largely rural. Not surprisingly, Gauteng had the largest overall bed number with 29 181 beds, comprising almost equal numbers of public and private beds. The large number of public hospital beds were as a result of the four tertiary/central hospitals and 11 regional hospitals in the province.

The EC, which is portrayed as resource limited, due to the fact that it comprises a largely rural population and most districts fall into SEQ 1, had seven level three hospitals and the largest number of district hospitals in the country. The largest number of total hospital beds were located in some areas that were rated as the lowest SEQ in 2011, following the national census. These areas had between 5 000 and 11 000 beds per district and were rated as 1 or 2 on a SEQ scale (1 being worst and 5 being best). The beds were largely public sector beds, although OR Tambo had a reasonable number of private hospital beds when compared with other districts. Even though these poor areas have large numbers of hospitals and beds, they still have the highest mortality rates in the when compared with other provinces. This demonstrates that although hospital infrastructure appears well-resourced in these areas, other inputs and processes which affect health outcomes are inadequate.

As mentioned, the EC province sees a negative net migration (largely to the neighbouring WC), and despite the large number of hospital beds the bed utilization is low. The fewest total hospital bed number are found in the Northern Cape (n=2 015) and North West province (n=4 877). These provinces have no central hospitals and very few private beds. The North West province experienced a positive net migration of 65 254 between 2011 and 2016, despite having the fewest hospital beds in the country. Therefore bed capacity alone has important limitations in the information it is able to offer those involved in health care planning.

A closer look at health outcomes in these provinces will provide greater understanding as to whether or not fewer hospital beds with a growing provincial population has any demonstrable negative effects. There is debate as to which health outcomes are most valuable to measure, however the LCoGS recommends that *perioperative morality rates* be measured by 80% of countries by 2020, and by 100% of countries by 2030. [9]

The total number of hospital beds had decreased since 2006, but more remarkable was the overall reduction in hospital bed number since 1993. [65] Chetty reported 161 949 public and private hospital beds (404.87 per 100 000). This number had decreased to 102 229 hospital beds (186.64 per 100 000) in the past 20 years, despite the population increasing from 40 to 54 million. Privatization had already been noted to be increasing between 1988 and 1993, with the addition of 72 new private hospitals during that period. (Table 149 _ Appendix Q). Most provinces have seen a dramatic reduction in total bed number since 1993, with the exception of MP which had a 2% increase in bed number. Overall, South Africa had experienced a 36% reduction in beds as well as a reduction in beds per 100 000, which needs to be rationalised.

Hospital beds per 100 000 were greatest in the metropolitan areas with the largest number of total beds per population found in Gauteng (225.95 per 100 000), followed by the Free State (216.80 per 100 000) and KwaZulu-Natal (214.03 per 100 000). Despite the Western Cape having a metropolitan municipality and being rated 5 for SEQ, it had fewer hospital beds per population (174.22 per 100 000) than the Eastern Cape (184.43 per 100 000). The Western Cape however, experiences a mortality rate half that of the Eastern Cape. The Western Cape and its health system have been reported to be one of the best in South Africa; Discovery Heath released a list of the top 20 hospitals in the country, nine of which were located in the WC. Although there are fewer facilities per population, these appear to be managed more efficiently than other provinces.

When private hospital beds were excluded from the equation a more disproportionate image was found. Mpumalanga's bed number per population fell to 95.5 per 100 000, followed by the Northern Cape with 92.81 public hospital beds per 100 000. The Western Cape and Gauteng were third and fourth lowest when it came to public hospital beds, despite both provinces being in the highest SEQ.

Public beds had experienced a similar, but slightly less pronounced reduction in number since 1993. Provinces such as the NW and LP had seen large reductions in public bed number, placing further strain on these rural areas by having diminished resources. The overall reduction was 18%, with two provinces (MP and NC) seeing increases of 6%. (Table 150 _ Appendix Q). International comparisons show large variations in hospital bed numbers and with hospitals resulting in an increasing expense, there is growing pressure to reduce hospital capacity. [80] The challenge remains to minimize expenditure while maintaining an acceptable level of health care which does not result in increased morbidity and mortality.

The question has been posed as to why hospital beds are reported as part of healthcare infrastructure and what information they provide. They have been described as 'merely items of furniture on which patients can lie'. [80] For beds to make meaningful contributions to health infrastructure, staff, equipment and various materials are needed. There are different beds reflecting the different patients they are designed to accommodate, for example rehabilitation beds are different from ICU or surgical beds. Similarly there may be items of furniture that are seen as 'beds' but are in fact chairs, as in dialysis units. Understanding the limitations of reporting bed numbers as measures of adequacy of surgical infrastructure is important for policymakers to consider when using this metric to plan resource allocation.

Similarly, determining the number of hospital beds needed to provide adequate surgical care is not easy and depends on disease patterns and social factors. In South Africa, the HIV burden and its association medical and surgical complications have placed a greater need for hospital admissions. In addition to this, high poverty levels (measured through the deprivation index) require patients to stay in hospital for longer periods in order to receive basic outpatient care that may inaccessible in their communities. For example, patients are admitted to surgical wards for wound care when in developed countries these could be treated at local clinics or at home.

Various modelling methods are available calculate the number of beds required in a particular setting as these take into account different factors and test assumptions, but are often unavailable and require expertise to perform. [80] There have been suggestions that by reducing bed numbers, if appropriately managed, could lead to improved quality of care. This would include more intensive use of existing beds, many of which are improperly utilized; protocols to reduce inappropriately long lengths of hospital stay; and a shift towards ambulatory or out-patient care when appropriate.

Surgical beds

There were 22 758 designated general surgical beds in South Africa. Other specialist surgical beds in level three hospitals, such as cardiothoracic surgery and plastic surgery beds were excluded. At district level hospitals, the bed allocation was dynamic depending on the pathology which was admitted. Wards were often allocated to male and female wards and no specific beds were kept for surgical patients. Over half (53%) of the surgical beds in South Africa were in the public sector. Both private and public surgical beds were concentrated in Gauteng, the Western Cape and KwaZulu-Natal. The largest number of private sector surgical beds were in GP, whereas the largest number of public sector surgical beds were in KZN.

In the public sector, surgical beds typically comprised 17.2% of the total hospital bed number, with a range of 14.9% (Limpopo) to 26.7% (Western Cape). In the private sector, surgical beds made up a much larger proportion of beds (33.8%), with a range of 29.3% (Mpumalanga) to 39.4% (Eastern Cape). Overall, in South Africa, surgical beds comprised 22.3% of the total number of hospital beds.

Surgical beds are known to generate greater revenue which could explain why the private sector had a greater proportion of hospital beds allocated to surgical patients. The inability to allocate district level beds to a medical or surgical discipline meant that these beds were not included in public sector surgical beds, which could misrepresent the true surgical bed number. This highlights why measuring bed numbers in isolation, and in particular surgical beds, is inadequate to understand surgical capacity. Far more resources other than surgical beds and operating theatres are required to provide surgical care. Preoperative and postoperative care encompass a broad range of diagnostic and therapeutic modalities which have been laid out in the Global Surgery National Surgical Plan template _ (Appendix C).

When the number of surgical beds are compared across different levels of care, district hospitals reported a range of surgical beds from as few as 146 in the NC to as many as 1 670 in KZN. (Table 21 _ Appendix Q). In all provinces, district level surgical beds were more numerous that regional level surgical beds and yet most district level facilities refer their surgical cases to regional facilities for treatment. In particular, KZN district level hospitals were found to be performing very few surgeries apart from caesarean sections. [67] With far more surgical beds available at district facilities and the knowledge that surgery at this level is more cost-effective, [31] there needs to be an emphasis on performing greater volumes of surgery at this level. This would involve ensuring operating theatres are ‘functional’ and that sufficiently qualified surgical, anaesthetic and nursing staff are available to perform these surgeries.

Although, level three surgical beds were most numerous in EC (n=945), GP (n=848) and WC (n=509), it is doubtful whether these reflect surgical volumes. Measuring actual surgical volumes would allow policymakers to assess which provinces are utilizing their surgical beds most efficiently and how they could be optimized to enhance surgical capacity.

Worldwide comparison

The uniform reporting of hospital beds is unfortunately absent, as countries use different definitions for hospital bed number. Despite this, there has been a decrease in worldwide bed number since the 1990s.

South Africa has 186 hospital beds per 100 000, whereas according to the World Bank, Australia has the highest with 382 per 100 000. The UK (294 per 100 000) and USA (299 per 100 000) have 60% more hospital beds per population than South Africa. Brazil is another UMIC which can be used as a comparative, and has around 230 hospital beds per 100 000. Kenya and Zambia are classified as LMICs, and have 140 and 190 hospital beds per 100 000, respectively. Uganda, Tanzania and Mozambique have the fewest beds per population indicating limited resources which coincide with being LICs. Surgical beds are currently not used as a measure of surgical resources and no global data exist as a comparative for South Africa's 41.55 surgical beds per 100 000. This could be as a result of surgical beds numbers being poor indicators of surgical capacity for reasons mentioned earlier.

Countries such as Australia have undergone a 38% reduction in hospital bed number between 1981 and 2009. They had 640 beds per 100 000, and now have under 400 beds per 100 000 (270 of which are available in the public sector). [78] Canadian bed capacity has remained stable, and even declined since the 1960's. It was reported that there were 172 000 public beds in 1960, 198 000 in 1970, and 161 000 in 1993. [79] There has been a similar decline in the number of hospitals. In comparison with South Africa, the private sector had not offset this change. They experienced a decline in private hospital number and bed number as well as federal hospital number and bed number.

European countries were not excluded from this decrease in bed number. Finland, Sweden and Russia have seen a similar reductions of 47% and 45% since the 1990s, while most other western European countries experienced reductions of between 10% and 20%. [80] It was suggested that a reduction in bed number was as a result of re-designation of long term care facilities in an attempt to decrease length of hospital stay. [68, 69, 80] Countries such as Kazakhstan experienced unplanned reductions in bed numbers as a result of funding withdrawal, whereas Estonia experienced closure of smaller, poorly equipped hospitals. [80]

The fixed supply of hospital beds with an increasing population could result in limited access to hospitals and their treatment. Governments have tried to limit health expenditure by reducing hospital bed numbers, in the belief that fewer beds mean greater efficacy, as patients spend less time in hospital. A Cochrane Review which assessed the efficacy of discharge planning, found that it may have reduced length of hospital stay and possibly readmissions. [81] However another study concluded that this resulted in an increase in the overall period of care and provided little in terms of cost savings. [82]

Although an emphasis has been placed on improving and strengthening primary care, it is important not to overlook the need to optimize hospital capacity. Lack of hospital beds, specifically surgical beds, could negatively impact on patient outcomes. Patients are left in emergency departments with suboptimal monitoring, elective surgeries are postponed or cancelled, and patients are discharged early due to 'bed pressure'. Some patients who are already admitted in district or regional hospitals might require transfer to tertiary referral hospitals for more appropriate care. These patients may spend days waiting for a bed to become available, resulting in delayed treatment.

Increasing bed capacity in order to improve surgical capacity needs to factor in both population density as well as theatre capacity. Simply increasing bed numbers in relation to the number of patients would meant little unless the beds were accompanied by functional operating theatres as well as other components of perioperative care.

Bed and hospital numbers are not worth collecting in isolation and need to be understood in a broader context of the healthcare system, as they provide very little in the way of an analysis of surgical care. Identifying the number and location of surgical facilities will allow for surgical volume calculation, which could be used to calculate the burden of surgical disease (the met need). The proportion of the population with 2-hour access could be calculated which would indicate the number of people who have access to timeous emergency care. In this way, two of the three groups of Lancet Indicators could be tracked and analysed.

Functional operating theatres

Operating theatres provide a structural indicator of the ability to provide surgical interventions. There were 1 969 functional operating theatres in South Africa. The actual theatre number was over 2 000, but some of these were not utilized for various reasons. The majority of under-utilized theatres were located at district level hospitals, and common reasons for non-use included lack of theatre staff (nurses, anaesthetists and surgeons) as well as non-functional anaesthetic machines and lack of appropriate supplies.

Funk et al estimated that Southern sub-Saharan Africa had 3.1 operating theatres per 100 000 compared with HIC such as the UK which had about 25 theatres per 100 000. [43] The current data showed a more accurate estimate of 3.59 total functional operating theatres per 100 000, which was 42% lower than the global average of 6.2 per 100 000. This provides some testament to the accuracy of modelling methods currently in use.

The public sector had 899 theatres, or 1.64 per 100 000, whereas the private sector had 1 070 theatres (1.95 per 100 000). Gauteng and the Western Cape had around five theatres per 100 000 whereas provinces such as Limpopo and Mpumalanga had fewer than two theatres per 100 000. Whether public, private or total theatre density was assessed, all indicators fell short of the worldwide average of 6.2 theatres per 100 000. (Table 151 _ Appendix Q).

A global recommendation for the optimal number of operating theatres is still lacking. Analysis of theatre infrastructure alone is not comprehensive enough to make inferences about theatre functionality. Running water, the continuous supply of oxygen as well as pulse oximetry and theatre staff are all essential components which need to be assessed in order to determine theatre function.

Worldwide comparison

High income countries have between 15 and 25 theatres per 100 000, upper middle income countries in the Middle East and Latin America have between 4 and 4.5 theatres per 100 000, lower middle income countries have 1.9 to 4.7 theatres per 100 000, and low income countries have between 1 and 1.2 per 100 000. [43]

Although the unmet surgical need is difficult to quantify, Weiser et al showed that there were a disproportionately low volume of surgeries being performed in lower income countries. [8] It is estimated that at least 321.5 million surgical procedures would be required to address the burden of disease for a global population of 6·9 billion in 2010. Modelling projections estimate that the requirement in southern Sub-Saharan Africa is 5 093 surgical procedures per 100 000 people. [88] With there being far fewer functional operating theatres in developing countries such as South Africa, it is expected that fewer surgeries are being performed. This further limits access to safe and affordable surgery and invariably negatively affects health outcomes.

General Surgeons

The availability and composition of the health workforce is an important indicator of the strength of the health system. Deficiencies in surgical workforce would be expected given the political history and geographic location of South Africa. The surgical workforce in South Africa is limited and insufficient when compared to high income countries such as the UK and USA.

There were an average of 50 general surgeons passing the College of Medicine of South Africa (CMSA) examinations annually. However a significant number emigrate or retire, which further impacts on the number of active surgeons in the country.

A specialist general surgeon was defined as having completed the necessary training and examination requirements as set out by the CMSA, allowing them to be admitted to the Fellowship of the College of Surgeons (FCS) or having a Master of Medicine (MMed) equivalent. The problem with this non-inclusive definition is that there are many healthcare workers who do not meet these criteria and these doctors make up the bulk of the surgical workforce in underdeveloped countries.

Importance of mapping

An estimated 7 000 specialists work in the private sector compared with 4 000 that work in the public sector. [69] It was very difficult to obtain accurate data on how many surgeons were working in the private sector. However, it can be concluded that the majority work in private. By calculating the total number of registered specialist surgeons (n=894) and those working in public hospitals (n=376), the difference was calculated to be 57.9% who were not working in the public sector. The presumption was that the majority of these surgeons were working in private facilities in South Africa. Research conducted in South Africa in 2011 showed that 26.1% of the specialist general surgical posts in the public sector were vacant. The situation was particularly critical in Mpumalanga and the Eastern Cape, where 84% and 58% of the specialist general surgeon posts were vacant. [83] These vacant specialist post in the public sector reinforce the assumption that many specialist trained surgeons are practising in the private sector.

The American College of Surgeons Health Policy Research Institute (ACS HPRI) released surgical workforce maps of 2006 and 2011 and demonstrated workforce density per county, as well as trends over the 5 year period. They released an atlas of the surgical workforce in 2012, in the form of an interactive web-based data system, which revealed where surgeon shortages were limiting patient access to safe and timeous healthcare. [84] The atlas allowed policy makers to affect medical and surgical practice, including funding for medical education and specialist training. It also allowed assessment of existing surgical workforce shortages. [85] Surgical workforce mapping allows surgeons who are considering setting up practice, to answer questions around practice realities and locations. Surgical maps are of equal value to patients who can determine where surgical access is readily available.

Upgrading of current workforce databases to include electronic mapping capabilities needs to be considered as a matter of urgency. Specialist surgeons (including sub-disciplines), as well as those in various stages of training (career MO's, registrars and non-registered specialists from abroad) should be mapped in a similar manner as the ACS HPRI. Areas of need could be highlighted and may be used to inform where surgeons are most needed.

The 'certificate of need' proposed by the South African government in 2014 was meant to address inequalities between urban and rural areas. It was later withdrawn after vocal opposition from various medical associations. The National Health Care Act needs revision in the regard, but with insufficient data similar policies with be drafted without proper regulation. If workforce maps are in place and updated regularly, specialist and non-specialist surgeons could be contracted to work in areas of need for short periods as opposed to prohibiting them from starting practices in areas of their choice. Regulating surgical practice without reserve with only result in further loss of surgeons overseas and will only compound the current critical shortage.

Non-specialist surgeons and task sharing

A large number of non-specialist general surgeons are found throughout the country, and contribute significantly to managing the burden of surgical disease. They have no formal specialist qualification although many are extremely experienced surgically. Several of these doctors work as senior medical officers and may go on to specialize in surgery in the future.

Non-specialist surgeons were the only surgical providers in 65% of hospitals in South Africa, demonstrating their importance in the provision of surgical care. They comprised 64% of the general surgical workforce. This important information on the current state of surgical providers cannot be overemphasized.

There is a large contingency of senior general surgeons from countries such as Cuba, who have not written the South African FCS examinations but who are viewed as senior surgeons. They were not included in the specialist surgical group and this is a limitation in the way data was collected and reported. In addition, registrars who will progress to become specialist general surgeons were included in the non-specialist group. Unfortunately, these two cohorts of surgeons were not individually reported by the hospitals.

The general surgery training programme comprises a four to five year period where registrars are trained and complete and set of requirements set out by the CMSA, therefore it is important to note that these doctors will move from the non-specialist category away from peripheral hospitals towards more urban teaching hospitals when they become specialists. This further depletes the non-specialist pool of providers who contribute so profoundly to surgical care provision in South Africa. With the current social and political climate and the fact that several posts have become ‘frozen’ due to financial constraints, these non-specialist medical officer posts are not necessarily filled by new doctors. This is an important consideration for policymakers when deciding which posts are essential for provision of surgical care.

Until countries with a depleted surgical workforce can assemble a critical number of specialists to meet basic surgical needs, medical officers and other non-specialists will be essential in filling the gap. Countries such as Malawi, Uganda, and other COSECSA countries have been successful in utilizing non-physician clinicians to perform a variety of major general surgical procedures, with no apparent difference in outcomes. [47, 49, 51] However, this needs to be interpreted with caution, as specialists are trained to make complex decisions and this cannot entirely be substituted by non-specialist physicians.

There were measurable disparities in the number and distribution of general surgeons in South Africa. There was less than one specialist surgeon per operating theatre (0.45), and even when non-specialist general surgeons included, this ratio remained less than one (0.99). There were 1.78 specialist general surgeons per 100 000, of which 0.69 specialist general surgeons per 100 000 were working in the public sector. There were 2.90 non-specialist general surgeons per 100 000, compared with 4.7 per 100 000 recommended by the US. [58]

Urban provinces such as Gauteng, the Western Cape, and KwaZulu-Natal as well as the Free State, expectedly had the largest number of specialist general surgeons per 100 000. These areas had the largest number of medical aid beneficiaries, and as demonstrated, nearly 60% of specialist general surgeons work exclusively in the private sector. The largest number of specialist surgeons per population were in the Western Cape (3.41 per 100 000) and Gauteng (2.30 per 100 000). Limpopo and Mpumalanga had the fewest surgeons per population with approximately 0.30 per 100 000 respectively.

Provinces which had seen a decrease in their population number or which had dropping employment rates naturally lose specialists, as they leave these areas and choose to start practices elsewhere. This contraction and expansion of supply and demand sees most specialists concentrating in urban cities.

The majority (65%) of specialist surgeons were working at level three or central hospitals in urban areas, with 28% working at regional hospitals, and only 7% working at district level facilities. Non-specialist surgeons were predominately located at district level hospitals (54%) and tertiary hospitals (28%), whereas 16% were located at regional hospitals. An assessment of surgery at South African district hospitals demonstrated that the volume of surgeries being undertaken was low, and that almost no abdominal surgeries were performed. [67] The most commonly performed operations in rural South Africa were obstetric operations, yet the competency to safely deliver obstetric anaesthesia seemed to be deficient. A letter published in the *World Journal of Surgery* highlighted the limited role which specialist surgeons play at district level hospitals because of the need for ancillary services. [86] The objective should be to provide adequate surgical expertise at the district level, without the use of specialised level three investigations and services.

When specialist and non-specialist surgeons were combined, 45% were found to be working at district level hospitals, 19% at regional level hospitals and 36% at central level hospitals. This suggested that the regional level hospitals had a limited surgical workforce which was inadequate to deal with the surgical burden of disease. Regional level hospitals often bear the brunt of the referrals within the system in which they drain large numbers of patients from district level facilities. The regional hospitals are then expected to manage most, including the most complicated, surgical conditions. Regional hospitals often experience difficulty in referring to central hospitals, as these facilities also receive numerous referrals from other regional hospitals, and need to transfer patients back to referring hospitals once stabilized.

There were provincial differences in the proportion of specialist surgeons working in the public hospitals. Mpumalanga had 21% of its specialist general surgeons working in public hospitals, which along with provinces such as the Western Cape, Limpopo, Free State and KwaZulu-Natal, was fewer than the national average of 42%.

Gauteng, the Northern Cape, the Eastern Cape and the North West had between 50% and 63% of specialist surgeons working in public sector hospitals. Apart from the Gauteng Province, the rest of these provinces were rural provinces, which might explain why a larger proportion worked in public hospitals. With fewer surgeons working in these provinces and with a fewer number of private hospitals, more surgeons are available to work in the public sector. Another reason for working in the public sector hospitals may be a moral desire to serve the underserved rural population in these provinces.

Worldwide comparison

South Africa had 1.78 specialist general surgeons per 100 000. In comparison HICs had seven per 100 000 (USA) and even as many 30 per 100 000 (UK). Other UMIC have not published their surgeon number and therefore no comparison could be drawn. LMIC have between 0.3 and 0.55 surgeons per 100 000, whereas LIC have 0.05-0.3 per 100 000.

The Lancet Commission on Global Surgery estimated that around 12% of specialists in HIC graduated from medical schools in LMICs, indicating a cycle of emigration, strain on residual workforce and further emigration. [9] It is common-place for South African surgeons to further their surgical training abroad, through fellowship programmes which could take a year or more to complete. Some of these surgeons are offered permanent employment and residency in these countries. The challenge would be to encourage further training in developed countries, but to incentivise their return after completion.

Limitations of mapping surgical workforce in South Africa

The Lancet commission and WHO recommended quantifying the surgical, anaesthetic and obstetric workforce, and suggested that between 20 and 40 specialists were needed per 100 000 to provide adequate surgical services. [9] The remaining indicators still need to be quantified in South Africa.

Other sub-specialist surgical specialists such as maxillofacial, ophthalmology, orthopaedics, paediatric surgeons, neurosurgeons, urologists, otorhinolaryngologists, plastic and reconstructive surgeons as well as obstetricians and gynaecologists were excluded as part of this research as a means of simplifying the enormous amounts of data which was collected. Sub-specialist general surgical disciplines such as vascular surgeons, endocrine surgeons, colorectal surgeons, hepatobiliary surgeons and trauma surgeons were included but no sub-analysis was performed.

Specialist surgeons were difficult to quantify as the HPCSA provincial and national databases differed. These in turn differed with the CMSA and Medpages databases. Unpublished data showed that 0.8% of surgeons registered on the HPCSA website were deceased, as many as 15% were retired, and 4.5% were working overseas. [76]

It was not clear whether surgeons were registered using their home address or practice addresses, and therefore quantifying surgeons according to district was inaccurate. The only means of determining the number was to assess the number of specialists working at public hospitals, as they are usually contracted to work in a single facility. An attempt was initially made to quantify specialist surgeons working at private hospitals, but this was abandoned as a single surgeon would work at more than one private facility, and would migrate between regions depending on career opportunities. Ideally, the comparison of full-time equivalents working in each sector could have been used as a substitute for comparison.

When quantifying the non-specialist general surgeon number, only doctors who were able to perform general surgeries such as laparotomies, amputations and hernias were included. If this were not the case, these ‘surgeons’ were excluded. Further research is needed to quantify surgeons only capable of performing caesarean sections, which should be included as part of the obstetric workforce. It was found that caesarean sections were often the only surgeries being performed at district hospitals. This affirms findings by Clarke et al, who found this to be the most frequent type of surgery being performed in district hospitals in South Africa. [67]

Workforce data is dynamic and needs to be assessed annually, with regional trends being evaluated periodically (every 5 years). An electronic database would be the best way forward to allow accurate and periodic assessment of data.

Training of additional surgical specialists, as well as providing support to non-specialist surgeons is critical in bridging the workforce gap. Incentivised retention policies aimed at attracting surgeons to geographic areas of need, as well as returning from overseas will need to be explored. [9] Identifying surgical trainees early in their careers, investing in their specialization and creating additional registrar training posts are means of expanding the workforce. Non-specialist doctors need to be supported as the majority of these practitioners work at district level hospitals and are invaluable in service provision. Task sharing with adequate training and supervision has been adopted in several African countries and remains a potential means in coping with the growing surgical burden of disease. [38, 39, 40, 41]

Private hospitals

Private hospitals are an important part of the South African health care system, although only 8.5 million people (16%) have health insurance. [68] Although the largest burden of health care provision falls upon the public or government funded sector, there is an increasing trend of self-funding patients accessing the private sector. [68] The largest number of medical aid beneficiaries were in GP (26.6%), followed by the WC (25.5%) and the FS (18%), whereas rural provinces such LP (8.7%), EC (11.4%) and MP (13.3%) had limited access to private services. [64, 68] There were 217 private hospitals in South Africa, with the majority of them located in the major metropoles (WC, KZN and GP). This coincided with the largest number of medical aid beneficiaries.

Self-funded patients are patients who are able to afford private medical treatment and do not necessarily rely on medical aid schemes in order to do so. They often cover medical and surgical procedures using out-of-pocket payments directly to health-care providers. HASA estimates that the population served by private hospitals is much higher than just the medical aid scheme population, but the exact number has not been verified. Netcare reported that this was particularly evident in obstetric cases. [68]

Private hospitals claim that there total revenue collection may be as high as R4 billion greater than the total amount spent by medical aid schemes. The reasons behind why non-medical aid scheme users access private medical care have been mentioned; these include a perception of better quality treatment amongst others.

User fees contribute to high levels of impoverishing and catastrophic expenditure attributable to the use of surgical and anaesthetic care in LMICs. [9] These financial barriers further limit access as a result of medical impoverishment. The dramatic reduction in the number of public hospital beds (36% between 1993 and 2014), could drive patients to seek private health care at their own expense. This places a particular burden on individuals earning low incomes.

It should be noted that making health care free at the point of access has resulted an exponential increase in the use of these services in countries like Sudan and Senegal, where user fees were removed for caesarean sections. [9] This could result in similar delays in treatment as a result of long waiting times and an overwhelmed system. Therefore, the proposed NHI may result in unexpected impoverishment of those patients it intends to assist.

Total hospital beds and surgical beds in the private sector

The average private hospital had 144 beds, 48 surgical beds and 5 operating theatres. Netcare, Life, Mediclinic and Independent groups were the largest private hospital groups. The HST records and reports total hospital numbers per province but not individual hospitals. Therefore, the review of the private hospital data relied heavily on HASA and information they deemed acceptable to release.

There were 31 312 privately owned hospital beds in South Africa. The largest proportion of these were found in GP (n=14 326), KZN (n=4 802) and the WC (n=4 391). There was a 21% increase in bed number between 2006 and 2010. Thereafter the bed number seems to have remained fairly stable overall with only a moderate increase of around 250 beds between 2010 and 2014. The overall reduction in public bed number between 2007 and 2014 may have contributed to this increase and may be contributing to a rise in personal health expenditure as patients are forced to access private health care. (Table 152 _ Appendix Q).

Private beds comprised 31% of total hospital beds in South Africa, which was a substantial increase from the 21% reported in 2006. [68] Four main hospital groups own 89% (around 28 000) of total private hospital beds, with 46% of private beds being located in the most populous Gauteng Province. There were 10 578 general surgical beds in the private sector. These were specifically allocated to general surgery and excluded medical, paediatric and intensive care beds.

The largest number of private surgical beds were located in GP (n=4 837), WC (n=1 560) and KZN (n=1 449). Gauteng has three times as many surgical beds when compared with other metropoles such as WC and KZN. With its significant contribution to the national GDP, this is not surprising. Having greater insight into the burden of surgical disease would allow policy makers to see whether provinces such as GP and WC do in fact have a greater surgical caseload or whether this concentration of surgical beds is incentivised by revenue generation. Mpumalanga had the fewest number of private surgical beds as a proportion of total bed number (29.3%), and the EC and NW Provinces have the largest proportion (39.3% respectively).

South African private hospitals allocate approximately a third of total hospital beds to surgical patients whereas public hospitals have 15-26% of their beds allocated to general surgery. Previous studies reported the ratio of surgical beds to total bed number to be around 33%, and they suggested that this was a consequence of greater numbers of surgical admissions. [68]

Although the ward fee for a general ward or an intensive care unit (ICU) bed is the same for a medical or surgical patient, the overall cost is higher as a result of theatre time and consumables such as surgical devices.

It is estimated that surgically treatable disease account for 30% of the burden of surgical disease (BoSD), [9] however only 16-20% of the South African population have access to private healthcare. This implies that the greater proportion of surgical diseases require treatment in the public sector. With almost an equal number of public (n=12 170) to private (n=10 578) surgical beds and fewer public sector operating theatres (899 versus 1 070), surgical capacity is inappropriately represented in the public sector. This needs to be verified by assessing the actual number of surgeries being performed, but does suggest potential inequity when addressing with the BoSD.

The unmet surgical need is difficult to analyse in terms of health care sectors as patients who are unable to access private surgical care usually transfer to the public sector in search of treatment. Private sector beds are more readily available and patients are often less unwell than public sector patients. Their health-seeking behaviour often involves accessing health care early and prior to the development of complications. This may be as a result of their level of education as well as experiencing fewer barriers to accessing treatment. It is likely that the unmet surgical need is much lower than in the public sector, however few conclusions can be drawn by looking at private surgical bed numbers without their occupancy rates as well as their surgical caseloads (these could be used to determine the met need). Therefore recommendations to improve surgical capacity need to be tailored according to each sector as their needs may vary widely.

Functional operating theatres in the private sector

There were 1 070 private hospital operating theatres, 500 (46.72%) located in Gauteng, 171 (15.88%) in the Western Cape and 162 (15.14%) in KwaZulu-Natal. These metropolitan areas comprised nearly 80% of all private hospital operating theatres, which explained why many people migrate towards large cities in search of surgical care, further compounding the inaccessibility and cost of surgical treatment.

The largest number of operating theatres in the private sector were owned by Netcare (n=322, 30%), Life (n=286, 26.7%) and Mediclinic (n=244, 22.8%), which demonstrates a strong monopoly. When compared to public sector theatres, almost all of the private sector theatres were being utilized. Reinstating public operating theatre function is a means of increasing resource numbers through the use of existing infrastructure, as opposed to the expense of building new hospitals and theatres.

Trends in private sector surgical resources

The overall hospital number has remained static, despite a decrease in the number of Life Healthcare hospitals (56 to 50 facilities), as well as the number of Independent hospitals (54 to 48 facilities). This decrease was offset by an increase in the number of Mediclinic hospitals (44 to 48), Netcare hospitals (42 to 50) and Clinix hospitals (4 to 8).

There was an overall increase in the number of private hospital beds from 27 586 to 31 312 beds (21%). Netcare increased its bed number by 1500 beds, Mediclinic by 600 beds and Clinix group saw an increase of nearly 500 beds from 2006 to 2014. These three hospital groups have increased their coverage in terms of facility number as well as bed number.

Surgical beds increased from 9 692 beds to 10 578 beds in 2014. The Clinix group and Independents saw the largest increases in surgical beds with a marginal increase in Netcare surgical bed number. There was an increase in private hospital theatres from 968 to 1 070 theatres. Largest increases were seen in Netcare (276 to 322) and Life hospitals (257 to 286) as well as Independent hospitals (125 to 157).

The increase in surgical bed and theatre numbers could be explained by the fact that they generate greater revenue for hospitals and not necessarily as a result of the increased surgical need. Furthermore, the noticeable decrease in public hospital and bed number between 2007 and 2015 may have encouraged the expansion of private infrastructure. This, along with the general perception that the public sector healthcare system is inferior, and the increase in the number of individuals with medical aid, could be promoting privatization.

With the implementation of the NHI, which is already being piloted in 11 districts in South Africa, acceptability of both private and public health-care needs to be carefully considered. The current perception that private health-care is superior, will result in an exponential increase in demand for private specialists and services.

Although an attempt had been made to control the increase in private bed number by placing a moratorium on this area of growth, this has been circumvented. This has been accompanied by a rise in the cost of private healthcare as well as the number of private resources which are available. It is important to consider that although the private health system contributes significantly to healthcare provision, it may result in ineffective decision making regarding resource allocation. [68, 69]

Public versus private resources

There were 50% more public hospitals (n=327) compared with private hospitals (n=217) in South Africa. Although there were more public hospitals numerically, they served over 80% of the population, whereas private hospitals were accessible to a select few, predominantly urban dwellers. There are greater public hospitals per population than private hospitals. However, as mentioned, only 16% of the South African population have medical aid cover and access to private healthcare. These metrics are limited in the information they provide regarding surgical capacity and need to be contextualised. Notable differences were seen in the rural provinces, where private hospitals per population were far fewer than public hospitals. The Western Cape had a similar number of public and private hospitals per 100 000 and Gauteng was the only province with greater private hospitals per population (0.65 per 100 000) than public hospitals per population (0.20 per 100 000).

There were 31 312 private hospital beds and more than twice as many (n=70 917) public hospital beds in South Africa. The obvious difference in total usable hospital bed number was seen in the Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga and Northern Cape, which had far more public sector beds. Gauteng had almost an equal number of public and private beds, as did the Western Cape. This, however, did not measure equitable access to surgical services and remains a limitation of using bed number as a health metric.

The majority of provinces had fewer private hospital beds per 100 000 than public beds per 100 000. The Northern Cape was the only province with more private hospital beds per population (172.71 per 100 000) than public hospital beds (141.76 per 100 000). This province covered a large area of the country but had a low population density owing to its agricultural configuration. The Northern Cape has also seen a negative net migration since 2011 and somehow receives the highest primary health care expenditure of all provinces. [60, 64] Despite having a medical aid scheme coverage rate of 13.7%, which is lower than the national average, it has the largest number of private hospitals per population.

This could indicate that even medical aid coverage does not reliably predict where private hospitals are located. The surgical beds reflected the total hospital bed distribution with the exception of Gauteng where private surgical beds were almost twice as numerous as public surgical beds. In South Africa overall, private and public surgical beds per 100 000 were similar despite the individual provincial differences.

There were 899 functional operating theatres in the public sector and 1 070 theatres in the private sector. Gauteng had the largest overall number with 711 theatres, the majority of which are in private hospitals (n=500). The Eastern Cape had approximately half the number of private theatres than public theatres and Limpopo had less than a third of those found in the private sector. The remaining provinces had a reasonably equal distribution of functional operating theatres between the public and private sectors, but with inequitable access to them. These theatre numbers translated into 1.95 private operating theatres per 100 000 compared with 1.64 public operating theatres per 100 000 in South Africa.

Inferential statistics using Chi-squared testing (p-value <0.05 was significant) was used to analyse whether the proportions of surgical resources per 100 000 were equally distributed in all provinces. There was an unequal distribution of public hospitals per 100 000 ($p=0.0042$) and of private hospitals per 100 000 ($p=0.0108$) across the provinces. Despite the provincial differences in the remaining surgical resources for both public and private sectors, these were not statistically significant. This result demonstrates that not all observed differences were statistically significant but provides evidence to policymakers to show both private and public hospitals are not equally distributed across provinces. When deciding where facilities should be located, calculating the proportion that can access a facility within 2-hours (Lancet Commission Indicator, Appendix B), could be a useful departure point.

Population prediction and resource deficit calculation

South African population projections are based on an educated guess as projections are modelled on current population figures, migration data, mortality figures and fertility rates. National census figures and health and demographic surveys are taken into account along with historical data on births, deaths and migration. Using this data, population estimates are calculated for every country in Africa and the estimates are then aggregated for the continent. [60]

In Africa, the fertility rate has a major impact on projected population increases. The ten countries with the highest fertility rates in the world are located on the continent, these pose a significant challenge when it comes to predicting future population size. Fertility rates are declining in South Africa, but the speed of decline is uncertain and the makes population projections problematic. People living in Africa have the lowest average life expectancy in the world. The United Nations attributes this to a variety of factors including HIV, tuberculosis and malaria whose long-term impact on population growth is difficult to predict accurately.

Migration is the single-most difficult component of population change to measure reliably, according to the UN. Within South Africa migration patterns are influence by job and health-seeking behaviour as well as numerous other variables. South African suffers from a quadruple burden of disease as a result of HIV/AIDS, chronic diseases, poverty-related conditions and injuries which all contribute substantially to the number of deaths.

The Second National Burden of Disease Study derived best estimates of the number of deaths in each province and nationally for the period 1997-2010. [87] It was estimated that there was a reduction in mortality as a result of HIV/AIDS as well as the overall child mortality. However, a considerable burden was still attributed to non-communicable diseases with a concerning rise in diabetes. Injury related mortality had decreased but homicide rates remain unacceptably high. These changes in the health landscape highlight some of the successes as a result of health system strengthening, and identify areas of concern.

It is important to note that census figures for many African countries are not accurate. In some instances current population estimates are based on old census data and are little more than projections themselves. South Africa had an estimated population of 54 million people in 2014, and this is expected grow to 70 million by 2030. [62] There was one hospital per 100 000 people in South Africa and currently no international recommendation as to the optimum number needed to provide adequate surgical care. Facility numbers in themselves are not reliable as measures of access, however for this ratio to remain the same by 2030, then a further 154 hospitals would be needed. This equates to ten hospitals being built, per year for next 15 years.

It needs to be emphasized that simply creating the infrastructure is a small part of health system strengthening. Patients require timeous access to healthcare facilities, healthcare workers need to recognise surgical conditions early and refer patients to an appropriate surgical facility. Transportation needs to be safe and efficient and the receiving facility needs the adequate resources and theatre availably to offer surgical treatment.

In order to understand the above system, metrics are needed to measure the quality of a system. [67] The criteria for a 'good metric' are: It must be relevant, acceptable, feasible, reliable, sensitive to change, valid and able to differentiate. The chosen metric needs to be common to provide a sufficiently large denominator. Several metrics have been proposed, and are currently being debated as to their practicality.

There were 1.78 specialist general surgeons registered in South Africa in 2014. The Lancet Commission and WHO recommended between 20 and 40 SAO providers per capita. [9, 28] This recommendation included anaesthetic and obstetric providers, which have not yet been quantified. Based on the estimated global burden of disease in southern Sub-Saharan Africa, 5 093 surgical procedures are required per 100 000 people. The average surgeon in the US performs 398 surgeries annually - slightly less if they are female.[58]

There are different recommendation regarding the optimum surgeon number per 100 000, but the global consensus seems to be between five and seven general surgeons per 100 000. [83] For the current ratio of 1.78 surgeons per 100 000 to remain the same by 2030, this will result in a deficit of 352 surgeons.

If a ratio of 5 general surgeons per 100 000 is to be achieved in the next 15 years, a further 2 600 specialist surgeons will need to be trained. South Africa is currently producing 50 surgeons annually on average. If the surgeon output were to increase to 150 per year, South Africa could achieve these numbers in roughly 17 years. The surgical training programmes need to treble their output of specialists, or this goal with remain beyond reach.

There were 3.59 operating theatres per 100 000 people in South Africa. The physical space is of less consequence than all of the components needed to make it functional; water, electricity, oxygen and surgical staff. The WHO Situational Analysis Tool _ (Appendix A) demonstrates the large number of resources required in order for an operating theatre to be 'functional'. If the current ratio (3.59 per 100 000) were to remain the same, then an additional 544 theatres would be needed by 2030, in order to provide the current surgical output. By simply making use of existing operating theatres which are currently located in many district level hospitals, this number could be halved. This would require maintenance and replacement of infrastructure as well as providing adequately trained surgical staff at these facilities.

Far more resources were needed to sustain sufficient surgical infrastructure in order for a national surgical plan to be successful. In addition, clear recommendations were needed regarding the optimum surgical resource number, which would provide a standard against which countries could compare their current resources.

Policy implication

Surgical policy needs to be part of National Health Policy formulation and implementation. The inevitable increase in population size will result in further health-care inequity, unless action is taken to rectify this. The current study has indicated how part of the surgical resources and basic infrastructure are distributed in South Africa, which will allow accurate assessment and planning by government policymakers. They however need to be evaluated with other more robust indicators of surgical capacity. There is a need to acknowledge the major shortage of health-care providers with implementation of the NHI. The Health Department needs to record health-care workforce and infrastructure numbers and develop plans to achieve a minimum density by 2030.

Simply assessing hospital and bed numbers are not adequate in addressing the shortfalls in surgical capacity and as mentioned surgical bed numbers in particular are not representative of surgical outputs. There are numerous recommendations set out by the LCoGS that would need to be carefully assessed and incorporated into a National Surgical Plan. Importantly, surgery should not be seen as a competing priority when it comes to other health policies, but should rather be addressed with similar enthusiasm.

Limitations

This analysis provided a limited examination of some surgical resources. Provincial and district sub-analyses provided greater insight into these differences, and revealed interprovincial and intersectoral disparities. Although not all of the recommended surgical indicators have been captured and assessed, the database is in place to allow future data collection efforts. The measurement of hospital and bed numbers do not equate to provision of adequate surgical care and due to their limitations should not routinely be used as a measure of surgical capacity.

The location of the hospitals however, can be used to calculate the proportion of patients who are within 2-hour access of these facilities. This will build on the recommendations set out by the Lancet Commission and will assist policymakers when planning locations of services relative to population density, transport systems and facility service delivery.

These data differ from those published by the HST in 2014 (total bed number), but corresponds with the estimate for operating theatre density. Reporting bias could have occurred as data were collected from different agents at each hospital. Most national audits use cross-sectional techniques to minimize labour intensity, and generate extrapolated data which is less accurate. This research included all South African hospitals, where surgery was taking place, which should improve accuracy.

Further research

Until a global database of surgical indicators are available, uncoordinated efforts and imprecise influence will continue. There is a need to evaluate the types of surgeries being performed across South Africa. This will determine the surgical burden of disease and provide a better perspective in order to re-appropriate resources to areas of greatest need.

There is also need to look at surgical outcomes, of which mortality data is too simplistic a measure. Large community-based surveys could be used to determine the total met and unmet need of surgical burden and could build on estimates already obtained through modelling projections. These metrics should be included in the next population census, a national household survey that looks at specific population indicators.

The surgical burden is significant and the surgical workforce needs to be adequately delineated. This should include remaining surgical personnel as well as nursing staff. Specialist and non-specialist surgeons could be sub-analysed in greater detail, to delineate sub-specialist qualifications, providing greater information towards surgical workforce mapping.

Recommendations

The Lancet Commission has proposed a template for a National surgical plan. South Africa is currently undergoing restructuring of its health-care system, therefore it seems appropriate that this plan be considered for implementation along with the NHI. The Lancet Commission on Investing in Health suggests ways in which health expansion may be financed; increasing 'sin-tax', intersectoral reallocation and efficiency gains, as well as external contributors. The NHI is an ambitious plan with questions surrounding its feasibility. It has been criticized as being unaffordable and not having the sufficient manpower in place to implement successfully. Be that as it may, any UHC policy should include surgery, and basic packages of surgical and anaesthetic care as delineated by the Lancet Commission.

There is a need for validated instruments to accurately collect data. Several practical surgical indicators have been proposed by the global community. The next step should be collective indicator use and interpretation by all countries. Surgical workforce and infrastructure guidelines are lacking. However these need to be proposed in order to calculate the exact resource deficit. This would allow countries to have a set of defined targets, much like the Millennium Development Goals. Surgical maps have been used successfully in the US to expose areas of need as well as provide information to doctors as well as patients. Surgical workforce densities should form part of any proposed indicators for health systems.

There is a lack of data regarding detailed output, short and long-term outcomes and evaluation of surgical programmes. Facility based data is collected but remains inaccessible despite its relevance and importance. There is a need for reliable electronic information sharing that will improve data collection and analysis between rural and urban areas. The existing surgical data collection systems are archaic and inadequate to perform robust comparisons nationally, or internationally. Implementing an electronic database, similar to the World Bank, would allow evaluation of surgical metrics for all countries.

Information management should combine population and facility based data collection (HPCSA, CMSA, Stats SA, HASA and HST) and have a single entity responsible for ownership, thereby updating the data regularly and performing period analyses of trends. The HST reviews health metrics with reasonable accuracy and frequency. This group seem to have the systems in place to oversee surgical data or perhaps a South African global surgery task team.

Existing resources need to be utilized more efficiently. These results have shown that regional hospitals severely lack general surgeons, both specialist and non-specialist. In addition, the international consensus is that district hospitals are cost-effective when it comes to surgical training and service provision. Performing surgery at district level hospitals improves access and decreases cost. However it will need recruitment of additional skilled personnel and infrastructure to support surgery. Specialist outreach has been in place for a number of years, but may not be as effective as they appear. Specialists who need access to ancillary services often refer to their higher level hospitals and clinics for further treatment. Surgeons who perform surgery at satellite hospitals and then return to their base hospitals often conduct limited follow-up of patients and neglect to take responsibility for complications.

There is a need to invest in human capital and to increase funding towards strengthening workforce and infrastructure. Scaling up the general surgical workforce to the proposed level, in the next 15 years is impractical. However, steps could be taken to improve the FCS pass-rate to 100%, matching those of the surgical college in Australia. Investing in non-specialist providers, can decrease overall training cost and time by 40%. Increasing the surgical workforce does not imply that the quality of surgery will improve. Therefore non-specialists need accreditation and supervision to achieve minimum safety standards. Lastly, reinforcing fellowship training agreements with developed countries, where it is understood that surgeons should return to their country of origin once their training is complete.

Improving access to surgical services in LMICs requires addressing gaps in infrastructure and personnel, as well equipment. These data may be used to shape global health policies, aimed at providing safe and equitable surgery to those in need. It identifies disparities between geographic regions which may be contributing to ongoing inequity in South Africa, and by doing so allows for evidence-based planning towards improving surgical infrastructure and workforce.

Modelling of data sets is challenging, however needs to be performed in order to better understand surgical data sets and is a recommendation for future research looking at surgical resources.

Conclusion

Surgical conditions are an important and growing public health priority. Strengthening surgical systems will reduce the surgical burden of disease and improve health outcomes globally. Little is known about the burden of surgical disease in LMICs, nor about the surgical resources available to deal with this burden. The description forms part of an overview of the surgical infrastructure and workforce in South Africa and has highlighted some limitations of using these metrics to evaluate surgical capacity. Several recommendations were made that could promote the global surgery agenda in South Africa.

Chapter 19: References

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Chapter 20: Appendices

20.1 **Appendix A:** WHO Situational Analysis Tool

World Health Organization

Powered by WHO Extranet DataCol

Tool for Situational Analysis to Assess Emergency and Essential Surgical Care

Reference: WHO Integrated Management for Emergency & Essential Surgical Care (IMEESC) toolkit: www.who.int/surgery.
Objective: to assess the gaps in the availability of EESC at resource constrained health facilities.
If you prefer to complete the paper version, please print and return this form by email cherianm@who.int or post or fax to the following address: Dr Meena Cherian, Emergency & Essential Surgical Care project Clinical Procedures Unit, Department of Essential Health Technologies, World Health Organization, 20 Avenue Appia, 1211, Geneva 27,Switzerland, Fax: 41 22 791 4836, www.who.int/surgery.

Section A: Infrastructure

Country *

Name, Phone no. of the person filling the form *

Email:

The email format is "xxxx@yyyy.zzz"

Name and Phone number of Health Care Facility *

Type of Healthcare Facility: * Health Center ☐ District/Rural/Community Hospital ☐ Provincial Hospital ☐ General Hospital ☐ Private/NGO/Mission Hospital ☐

Population served by this health facility (Eg: 100.000 or 1.000.000)

The input is of type "number"

	0	1	2	3-4	5-10	11-20	21-50	51-80	81-100	101-200	201-300	301-400	401-500	501-700	701-1'000	1'001-2'000	2'001-5'000	>5'000
Number of beds	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number of total admissions in one year	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number of total functioning operating rooms (major and minor)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number of patients at this facility requiring minor & major surgical (including Gyn/Obs) procedures per year	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number of children (aged less than 15 years) at this facility requiring surgical procedures per year	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number of patients to this facility that you refer for surgical intervention to a higher level facility per year	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
How far (in Km) does the average patient travel to get to your health facility for surgical services?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
If you do not provide surgical services, how far does the average patient travel (in Km) to access surgical services	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

	All the time	Sometimes	Not available
Do you have Oxygen cylinder supply?	○	○	○
Do you have Oxygen concentrator supply?	○	○	○
Do you have running water?	○	○	○
Do you have electricity source?	○	○	○
Do you have an operational power generator?	○	○	○
Do you have functioning anaesthesia machine?	○	○	○
Do you keep medical records ?	○	○	○
Do you have an area designated for Emergency care?	○	○	○
Do you have an area designated for Postoperative care?	○	○	○
Do you have management guidelines available for Emergency care?	○	○	○
Do you have management guidelines available for Surgery?	○	○	○
Do you have management guidelines available for Anesthesia?	○	○	○
Do you have management guidelines available for Pain Relief?	○	○	○
Do you have blood bank available at the facility?	○	○	○
Do you have facility to test haemoglobin & urine?	○	○	○
Do you have functioning X-ray machine available ?	○	○	○

Section B: Human Resources

	Number of Full Time Workers	Number of Part Time Workers	Number Certified/Registered/Licensed
Surgeons (qualified)	The input is of type "number"	The input is of type "number"	The input is of type "number"
Anaesthesiologist Physician (qualified)	The input is of type "number"	The input is of type "number"	The input is of type "number"
Obstetrician/gynecologist (qualified)	The input is of type "number"	The input is of type "number"	The input is of type "number"
General doctors providing surgery	The input is of type "number"	The input is of type "number"	The input is of type "number"
General doctors providing anesthesia	The input is of type "number"	The input is of type "number"	The input is of type "number"
Nurse/Clinical/Assistant medical officers providing anesthesia	The input is of type "number"	The input is of type "number"	The input is of type "number"
Clinical/Assistant medical officers providing surgery	The input is of type "number"	The input is of type "number"	The input is of type "number"
Paramedics/Midwives	The input is of type "number"	The input is of type "number"	The input is of type "number"

Section C: Interventions - Do you provide these procedures?

	Yes / No	Do you refer?	Refer due to lack of skills	Refer due to non-functional equipment	Refer due to lack of Supplies/Drugs
Resuscitation (airway, hemorrhage, peripheral percutaneous intravenous access, peripheral venous cut down)	yes no	yes no	yes no	yes no	yes no
Cricothyroidotomy /Tracheostomy	yes no	yes no	yes no	yes no	yes no
Chest tube insertion	yes no	yes no	yes no	yes no	yes no
Removal of foreign body (throat/eye/ear/nose)	yes no	yes no	yes no	yes no	yes no
Acute burn management	yes no	yes no	yes no	yes no	yes no
Incision & drainage of abscess	yes no	yes no	yes no	yes no	yes no
Suturing (for wounds, episiotomy, cervical & vaginal lacerations)	yes no	yes no	yes no	yes no	yes no
Wound debridement	yes no	yes no	yes no	yes no	yes no
Cesarean Section	yes no	yes no	yes no	yes no	yes no
Dilatation & Curettage gyn/obstetrics	yes no	yes no	yes no	yes no	yes no
Obstetric fistula repair	yes no	yes no	yes no	yes no	yes no
Appendectomy	yes no	yes no	yes no	yes no	yes no
Hernia repair (strangulated, elective)	yes no	yes no	yes no	yes no	yes no
Hydrocele	yes no	yes no	yes no	yes no	yes no
Cystostomy	yes no	yes no	yes no	yes no	yes no
Urethral stricture dilatation	yes no	yes no	yes no	yes no	yes no
Laparotomy (uterine rupture, ectopic pregnancy, acute abdomen, intestinal obstruction, perforation, injuries)	yes no	yes no	yes no	yes no	yes no
Male circumcision	yes no	yes no	yes no	yes no	yes no
Congenital hernia repair	yes no	yes no	yes no	yes no	yes no
Neonatal surgery: abdominal wall defect, colostomy imperforate anus, intussusceptions	yes no	yes no	yes no	yes no	yes no

Cleft lip repair	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○
Clubfoot repair	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○
Contracture release/skin grafting	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○
Closed Treatment of Fracture	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○
Open Treatment of Fracture	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○
Joint Dislocation treatment	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○
Drainage of Osteomyelitis/Septic Arthritis	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○
Amputation	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○
Biopsy (lymph node, mass, other)	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○
Tubal ligation/Vasectomy	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○
Cataract surgery	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○
Regional anesthesia blocks	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○
Spinal anaesthesia	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○
Ketamine intravenous anaesthesia	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○
General anaesthesia inhalational	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○	yes ○ no ○

Section D: Emergency Equipment and Supplies for Resuscitation

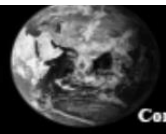
For details refer WHO IMEESC toolkit www.who.int/surgery/publications/imeesc; WHO ETC guidelines www.who.int/violence_injury_prevention/services; WHOEML www.who.int/medicines/publications

	0 absent	**1 available with frequent shortages or difficulties**	**2 fully available for all the patients all of the time**
Capital Outlays Resuscitator bag valve & mask (adult)	○	○	○
Resuscitator bag valve & mask (paediatric)	○	○	○
Oxygen source: cylinder/concentrator	○	○	○
Mask & Tubing to connect to oxygen supply	○	○	○
Stethoscope	○	○	○
Batteries for flash light	○	○	○
Suction pump (manual or electric)	○	○	○

Blood pressure measuring equipment	☐	☐	☐
Thermometer	☐	☐	☐
Scalpel handle with blade	☐	☐	☐
Retractor	☐	☐	☐
Scissors straight 12 cm	☐	☐	☐
Scissors blunt 14 cm	☐	☐	☐
Oropharyngeal airway (adult size)	☐	☐	☐
Oropharyngeal airway (paediatric size)	☐	☐	☐
Forceps Kocher no teeth	☐	☐	☐
Forceps, artery	☐	☐	☐
Kidney dishes stainless steel	☐	☐	☐
Capped bottle, alcohol based solutions	☐	☐	☐
Gloves (sterile) sizes 6 to 8	☐	☐	☐
Gloves (examination)small, medium, large	☐	☐	☐
Needle holder	☐	☐	☐
Sterilizer	☐	☐	☐
Nail brush, scrubbing surgeon's	☐	☐	☐
Vaginal speculum	☐	☐	☐
Bucket, plastic	☐	☐	☐
Drum for sterile compresses, bandages, dressings	☐	☐	☐
Examination table	☐	☐	☐
Renewable Items Suction catheter sizes 16 FG	☐	☐	☐
Tongue depressor wooden disposable	☐	☐	☐
Nasogastric tubes 10 to 16 FG	☐	☐	☐
Light source (lamp & flash light)	☐	☐	☐
Intravenous fluid infusion set	☐	☐	☐
IV cannula sizes 18,22, 24	☐	☐	☐
Scalp vein infusion set	☐	☐	☐
Syringes 2ml	☐	☐	☐
Syringes 10 ml	☐	☐	☐
Disposable needles # 25, 21,19	☐	☐	☐
Sharps disposal container	☐	☐	☐
Tourniquet	☐	☐	☐
Sterile gauze dressing	☐	☐	☐
Bandages sterile	☐	☐	☐
Adhesive Tape	☐	☐	☐
Needles, cutting & round bodied (for suturing)	☐	☐	☐
Suture synthetic absorbable	☐	☐	☐

Splints for arm, leg	☐	☐	☐
Towel cloth	☐	☐	☐
Absorbent cotton wool	☐	☐	☐
Urinary catheter Foleys disposable #12, 14,18 with bag	☐	☐	☐
Sheeting, plastic for examination table	☐	☐	☐
Waste disposal container	☐	☐	☐
Face masks	☐	☐	☐
Eye protection	☐	☐	☐
Apron, utility plastic reusable	☐	☐	☐
Soap	☐	☐	☐
Wash basin	☐	☐	☐
Supplementary equipment for use by skilled health professionals Magills Forceps (paediatric)	☐	☐	☐
Magills Forceps (adult)	☐	☐	☐
Endotrachael tubes uncuffed sizes 3.0 to 5.0)	☐	☐	☐
Endotrachael tubes cuffed sizes 5.5 to 9	☐	☐	☐
IV Infusor bags	☐	☐	☐
Chest tubes insertion equipment	☐	☐	☐
Laryngoscope handle	☐	☐	☐
Laryngoscope Macintosh blades (adult)	☐	☐	☐
Laryngoscope Macintosh blades (paediatric)	☐	☐	☐
Spare bulbs, batteries for laryngoscope	☐	☐	☐
Cricothyroidotomy set	☐	☐	☐

Submit the form



Global Surgery 2030

Core indicators for monitoring universal access to safe, affordable surgical and anaesthesia care when needed

Indicator	Definition	Rationale	Data Sources	Responsible Entity	Comments	Target
Group 1: Preparedness for surgical and anaesthesia care						
Access to timely essential surgery	Proportion of the population that can access, within 2 hours, a facility that can do caesarean delivery, laparotomy and treatment of open fracture (the Bellwether procedures)	All people should have timely access to emergency surgical services. Bellwether procedure performance predicts accomplishment of many other essential surgical procedures; 2 hours is a threshold of death from complications of childbirth	Facility records and population demographics	Ministry of Health	Informs policy and planning regarding location of services in relation to population density, transport systems and facility service delivery	A minimum of 80% coverage of essential surgical and anaesthesia services per country by 2030
Specialist surgical workforce density	Number of specialist surgical, anaesthetic and obstetric physicians who are working, per 100 000 population	The availability and accessibility of human resources for health is a crucial component of surgical and anaesthesia care delivery	Facility records, data from training and licensing bodies	Ministry of Health, Ministry of Education	Informs workforce, training and retention strategies	100% of countries with at least 20 surgical, anaesthetic, and obstetric physicians per 100 000 population by 2030
Group 2: Delivery of surgical and anaesthesia care						
Surgical volume	Procedures done in an operating theatre, per 100 000 population per year	The number of surgical procedures done per year is an indicator of met need	Facility records	Facility, Ministry of Health	Informs policy and planning regarding met and unmet need for surgical care	80% of countries by 2020 and 100% of countries by 2030 tracking surgical volume; 5 000 procedures per 100 000 population by 2030
Perioperative mortality rate (POMR)	All-cause death rate prior to discharge among patients who have undergone a procedure in an operating theatre, divided by the total number of procedures, presented as a percentage	Surgical and anaesthesia safety is an integral component of care delivery; perioperative morality encompasses deaths in the operating theatre and in the hospital after the procedure	Facility records and death registries	Facility, Ministry of Health	Informs policy and planning regarding surgical and anaesthesia safety, as well as surgical volume when number of procedures is the denominator	80% of countries by 2020 and 100% of countries by 2030 tracking perioperative mortality; in 2020, assess global data and set national targets for 2030
Group 3: Impact of surgical and anaesthesia care						
Protection against impoverishing expenditure*	Proportion of households protected against impoverishment from direct out-of-pocket payments for surgical and anaesthesia care	Billions of people each year are at risk of financial ruin from accessing surgical services; this is a surgery-specific version of a World Bank universal health coverage target	Household surveys, facility records	Ministry of Finance, World Bank, WHO, USAID	Informs policy about payment systems, insurance coverage, and balance of public and private services	100% protection against impoverishment from out-of-pocket payments for surgical and anaesthesia care by 2030
Protection against catastrophic expenditure†	Proportion of households protected against catastrophic expenditure from direct out-of-pocket payments for surgical and anaesthesia care	Billions of people each year are at risk of financial ruin from accessing surgical services; this is a surgery-specific version of a World Bank universal health coverage target	Household surveys, facility records	Ministry of Finance, World Bank, WHO, USAID	Informs policy about payment systems, insurance coverage, and balance of public and private services	100% protection against catastrophic expenditure from out-of-pocket payments for surgical and anaesthesia care by 2030

*Access, workforce, volume, and perioperative mortality indicators should be reported annually. Financial protection indicators should be reported alongside the World Bank and WHO measures of financial risk protection for universal health coverage. These indicators provide the most information when used and interpreted together; no single indicator provides an adequate representation of surgical and anaesthesia care when analysed independently. USAID=US Agency for International Development. Equity stratifiers are listed in report's discussion. *Impoverishing expenditure is defined as being pushed into poverty or being pushed further into poverty by out-of-pocket payments. †Catastrophic expenditure is defined as direct out-of-pocket payments of greater than 40% of household income net of subsistence needs.*

GS2030

20.3 **Appendix C:** National Surgical Plan Template

Global Surgery 2030

Template for a National Surgical Plan

Infrastructure		
Component:	**Recommendation:**	**Assessment Method:**
Surgical facilities Facility readiness Blood supply Access and referral systems	• Track number and distribution of surgical facilities • Negotiate centralised framework purchase agreements with decentralised ordering • Equip first-level surgical facilities to be able to perform laparotomy, caesarean delivery and treatment of open fracture (the Bellwether Procedures) • Develop national blood plan • Reduce barriers to access through enhanced connectivity across entire care delivery chain from community to tertiary care • Establish referral systems with community integration, transfer criteria, referral logistics, protections for first-responders and helpful members of the public	• Proportion of population with 2 hour access to first-level facility • WHO Hospital Assessment Tool (eg, assessment of structure, electricity, water, oxygen, surgical equipment and supplies, computers and internet) • Proportion of hospitals fulfilling safe surgery criteria • Blood bank distribution, donation rate
Workforce		
Component:	**Recommendation:**	**Assessment Method:**
Surgical, anaesthetic and obstetric providers Allied health providers (nursing; operational managers; biomedical engineers; radiology, pathology and laboratory technician officers)	• Establish training and education strategy based on population and needs of country • Require rural component of surgical and anaesthetic training programmes • Develop a context-appropriate licensing and credentialing requirement for all surgical workforce • Training and education strategy of ancillary staff based on population and needs of country • Invest in professional health-care manager training • Establish biomedical equipment training programme	• Density and distribution of specialist surgical, anaesthetic, and obstetric providers • Number of surgical, anaesthetic and obstetric graduates and retirees • Proportion of surgical workforce training programmes accredited • Presence of task sharing or nursing accredited programmes and number of providers • Presence of attraction and retention strategies • Density and distribution of nurses, ancillary staff including operational managers, biomedical engineers, and radiology, pathology and laboratory technicians
Service Delivery		
Component:	**Recommendation:**	**Assessment Method:**
Surgical volume System coordination Quality and safety	• All first-level hospitals should provide laparotomy, caesarean delivery and treatment of open fracture (the Bellwether Procedures) • Integrate public, private, NGO providers into common national delivery framework; promote demand-driven partnerships with NGOs to build surgical capacity • Prioritise healthcare management training • Prioritise quality improvement processes and outcomes monitoring • Promote telemedicine to build system-wide connectivity • Promote system-wide connectivity for telemedicine applications, clinical support and education	• Proportion of surgical facilities offering the Bellwether Procedures • Number of surgical procedures done per year • Surgical and anaesthetic related morbidity and mortality (perioperative) • Availability of system-wide communication
Financing		
Component:	**Recommendation:**	**Assessment Method:**
Health financing and accounting Budget allocation	• Cover basic surgical packages within universal health coverage • Risk pool with a single pool, maximise user fees at the point of care • Track financial flows for surgery through national health accounts • Use value-based purchasing with risk-pooled funds	• Surgical expenditure as a proportion of gross domestic product • Surgical expenditure as a proportion of total national health-care budget • Out-of-pocket expenditures on surgery • Catastrophic and impoverishing expenditures on surgery
Information Management		
Component	**Recommendation:**	**Assessment Method:**
Information systems Research agenda	• Develop robust information systems to monitor clinical processes, cost, outcomes and identify deficits • Identify, regulate, and fund surgical research priorities of local relevance	• Presence of data systems that promote monitoring and accountability related to surgical and anaesthesia care • Proportion of hospital facilities with high speed internet connections

The components addressing surgical care should be incorporated within a broader strategy of improvement of national health systems. NGO = non-governmental organisation. WHO = World Health Organisation

GS2030

20.4 **Appendix D:** Email to hospitals

Good morning,

Thank you for your assistance in the following:

As discussed I am collecting data as part of a PhD looking at Surgical Resources in South Africa. I am looking at both government and private hospitals. I have some data but it is very incomplete and I would greatly appreciate your assistance with the following for your hospital:

1. Total usable hospital bed number

2. Total general surgical bed number

3. Total number of functional operating theatres

4. Number of specialist general surgeons (FCS or MMed qualified specialists)

5. Number of non-specialist general surgeons (medical officers, registrars or doctors above intern level who are able to operate) *operations include laparotomies, amputations and hernias as examples.

I have received Ethics Clearance as well as Departmental Research Committee clearance from UCT.

Kind regards,

Dr Angela Dell
General Surgery Registrar
Bsc MBChB
021 404 4522
Department of Surgery
Groote Schuur Hospital
Cape Town, South Africa

20.5 **Appendix E:** Ethics Clearance

UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

FHS016: Annual Progress Report / Renewal

HREC office use only (FWA00001637; IRB00001938)			
This serves as notification of annual approval, including any documentation described below.			
☑ Approved	Annual progress report	Approved until/next renewal date	30/09/2015
☐ Not approved	See attached comments		
Signature Chairperson of the HREC	Signed	Date Signed	12/11/2014

Comments to PI from the HREC

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	25/9/2014		
HREC REF Number	515/2013	Current Ethics Approval was granted until	31/8/2014
Protocol title	Burden of Surgical Disease in South Africa		
Protocol number (if applicable)			
Are there any sub-studies linked to this study?	☐ Yes ☐x No		
If yes, could you please provide the HREC Ref's for all sub-studies? **Note:** A separate FHS016 must be submitted for each sub-study.			
Principal Investigator	Dr Angela Dell		
Department / Office Internal Mail Address	General Surgery J floor		

RESEARCH ETHICS COMMITTEE
2014 -09- 25
HEALTH SCIENCES FACULTY
UNIVERSITY OF CAPE TOWN

1.1 Does this protocol receive US Federal funding?	☐ Yes	☐ x No
1.2 If the study receives US Federal Funding, does the annual report require full committee approval?	☐ Yes	☐ xNo
1.3 Has sponsorship of this study changed? If yes, please attach a revised summary of the budget.	☐ Yes	☐ x No

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

Form FHS006: Protocol Amendment

HREC office use only (FWA00001637; IRB00001938)

☑ Approved ☑ Type of review: Expedited ☐ Full committee

This serves as notification that all changes and documentation described below are approved.

Signature Chairperson of the HREC: Signed Date: 30/9/14

Note: All major amendments should include a **PI Synopsis** justifying the changes for the amendment (please see notice dated 23 April 2012)

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	25/9/2014
HREC REF Number	515/2013
Protocol title	Surgical resources in South Africa – A review
Protocol number (if applicable)	
Principal Investigator	Dr Angela Dell
Department / Office Internal Mail Address	General Surgery J floor

RESEARCH ETHICS COMMITTEE
2014 -09- 25
HEALTH SCIENCES FACULTY
UNIVERSITY OF CAPE TOWN

1.1 Is this a major or a minor amendment? (see FHS006hlp) Major (tick box) Minor (tick box)	☐ x Major	☐ Minor
1.2 Does this protocol receive US Federal funding?	☐ Yes	☐ x No
1.3 If the amendment is a major amendment and receives US Federal Funding, does the amendment require full committee approval?	☐ Yes	☐ x No

2. List of Proposed Amendments with Revised Version Numbers and Dates

Please itemise on the page below, all amendments with revised version numbers and dates, which need approval.
This page will be detached, signed and returned to the PI as notification of approval. Please add extra pages if necessary.

Overall objective has changed to look at surgical resources (bed numbers, theatres and surgeons) and not actual surgeries being performed.

FHS016: Annual Progress Report / Renewal

HREC office use only (FWA00001637; IRB00001938)			
This serves as notification of annual approval, including any documentation described below.			
☑ Approved	Annual progress report	Approved until/next renewal date	31/03/2015
☐ Not approved	See attached comments		
Signature Chairperson of the HREC	Signed	Date Signed	3/9/2014

Comments to PI from the HREC

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	1 7 14		
HREC REF Number	513/2013	Current Ethics Approval was granted until	31/3/14
Protocol title	[illegible]		
Protocol number (if applicable)			
Are there any sub-studies linked to this study?	☐ Yes ☒ No		
If yes, could you please provide the HREC Ref's for all sub-studies? Note: A separate FHS016 must be submitted for each sub-study			
Principal Investigator	[illegible]		
Department / Office Internal Mail Address	[illegible]		

1.1 Does this protocol receive US Federal funding?	☐ Yes	☒ No
1.2 If the study receives US Federal Funding, does the annual report require full committee approval?	☐ Yes	☐ No
1.3 Has sponsorship of this study changed? If yes, please attach a revised summary of the budget.	☐ Yes	☒ No

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

FHS016: Annual Progress Report / Renewal

HREC office use only (FWA00001637; IRB00001938)			
This serves as notification of annual approval, including any documentation described below.			
☑ Approved	Annual progress report	Approved until/next renewal date	30/10/2016
☐ Not approved	See attached comments		
Signature Chairperson of the HREC	Signed	Date Signed	22/10/15

Comments to PI from the HREC

19 OCT 2015
HEALTH SCIENCES FACULTY
UNIVERSITY OF CAPE TOWN

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	19/10/15 ~~25/9/2014~~ DEA		
HREC REF Number	515/2013	Current Ethics Approval was granted until	
Protocol title	Surgical Resources in South Africa: A review		
Protocol number (if applicable)			
Are there any sub-studies linked to this study?	☐ Yes ☐x No		
If yes, could you please provide the HREC Ref's for all sub-studies? Note: A separate FHS016 must be submitted for each sub-study.			
Principal Investigator	Dr Angela Dell		
Department / Office Internal Mail Address	General Surgery J floor		

1.1 Does this protocol receive US Federal funding?	☐ Yes	☐ x No
1.2 If the study receives US Federal Funding, does the annual report require full committee approval?	☐ Yes	☐ xNo
1.3 Has sponsorship of this study changed? If yes, please attach a revised summary of the budget.	☐ Yes	☐ x No

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

Form FHS006: Protocol Amendment

HREC office use only (FWA00001637; IRB00001938)		
☑ Approved	☑ Type of review: Expedited	☐ Full committee
This serves as notification that all changes and documentation described below are approved.		
Signature Chairperson of the HREC	Signed	Date 3/6/16

Note: All major amendments should include a **PI Synopsis** justifying the changes for the amendment: (please see notice dated 23 April 2012)

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	01/06/2016
HREC REF Number	515/2015
Protocol title	Surgical resources in South Africa – A review
Protocol number (if applicable)	
Principal Investigator	Dr Angela Dell
Department / Office Internal Mail Address	General Surgery J floor

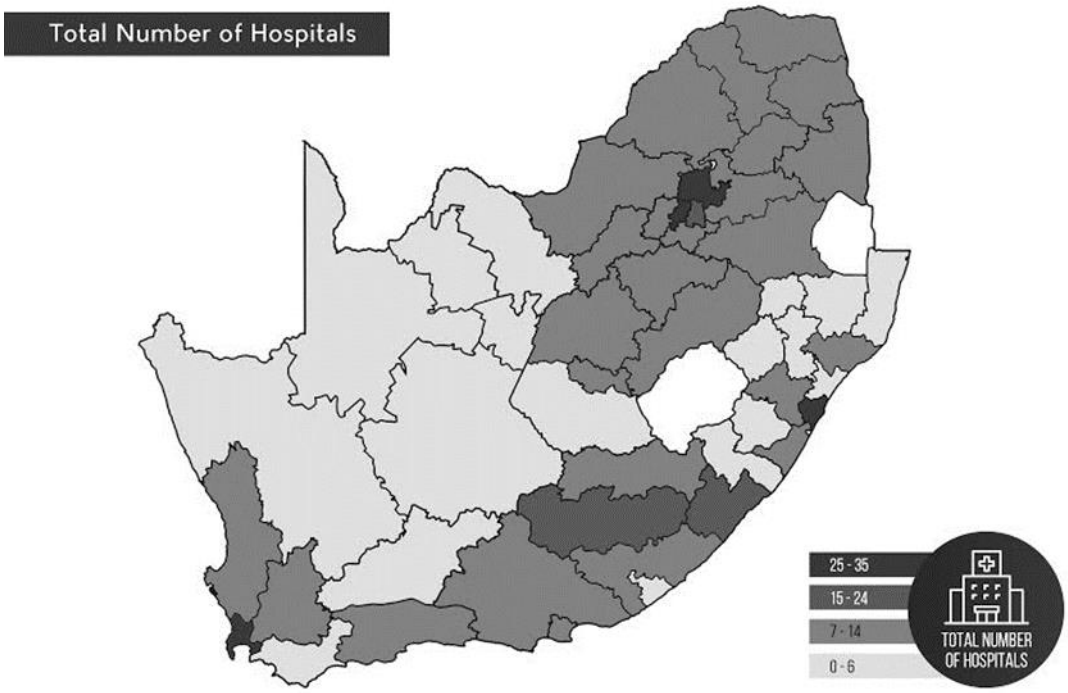
1.1 Is this a major or a minor amendment? (see FHS006hlp) Major (tick box) Minor (tick box)	☐ xMajor	☐ Minor
1.2 Does this protocol receive US Federal funding?	☐ Yes	☐ x No
1.3 If the amendment is a major amendment and receives US Federal Funding, does the amendment require full committee approval?	☐ Yes	☐ xNo

2. List of Proposed Amendments with Revised Version Numbers and Dates

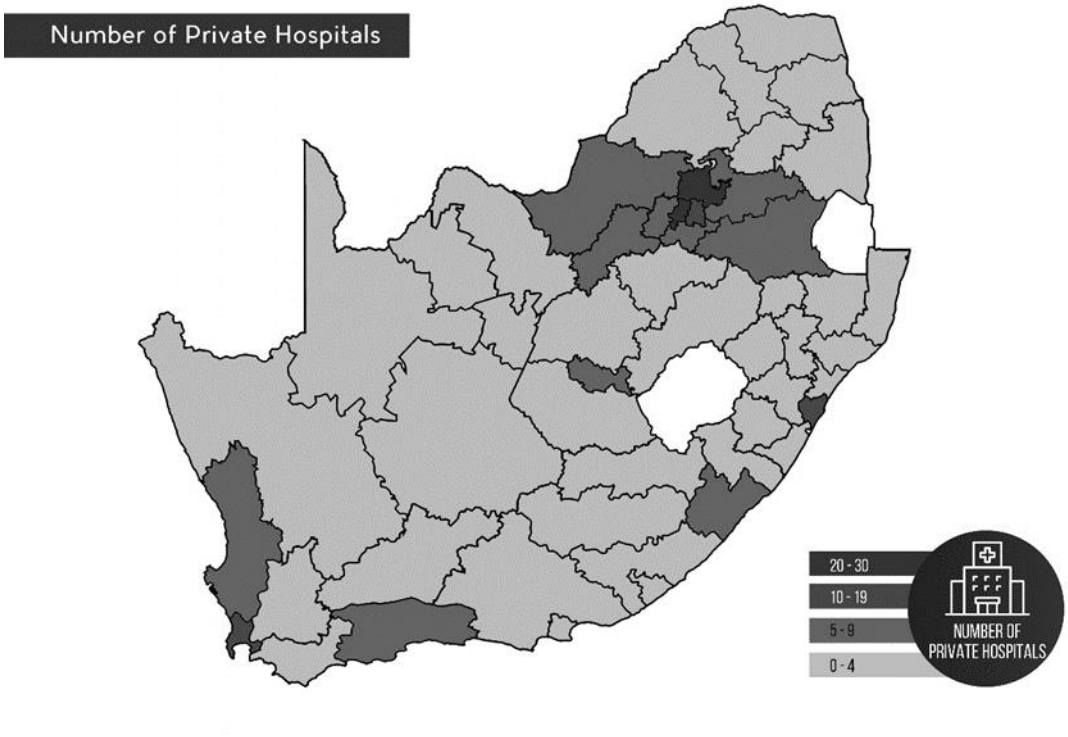
Please itemise on the page below, all amendments with revised version numbers and dates, which need approval.
This page will be detached, signed and returned to the PI as notification of approval. Please add extra pages if necessary.

Title changed from 'Surgical resources in South Africa – A review' to ' Global Surgery – Geographic and Socioeconomic Maldistribution of Surgical Resources' as this provides a more accurate description of thesis material and will allow it to be easily identified as part of this new emerging field of study (global surgery)

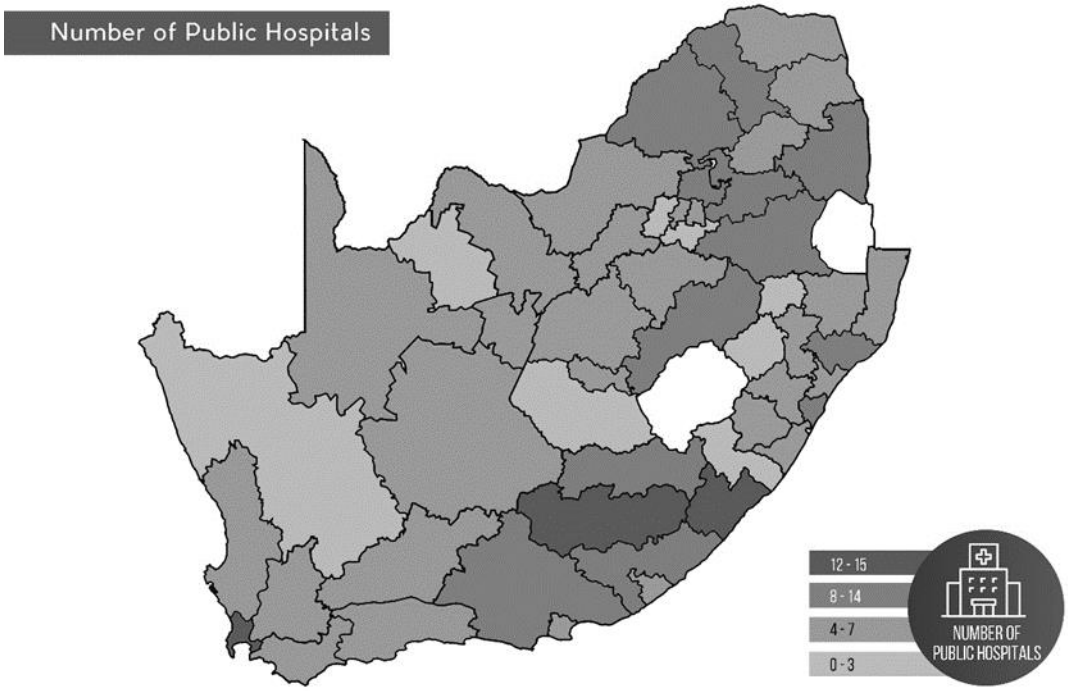
20.6 **Appendix F:** Chapter 4 Maps, Figures and Tables (National Results)



Map 4: Total hospital number according to district.



Map 5: Number of private hospitals according to district.



Map 6: Number of public hospitals according to district.

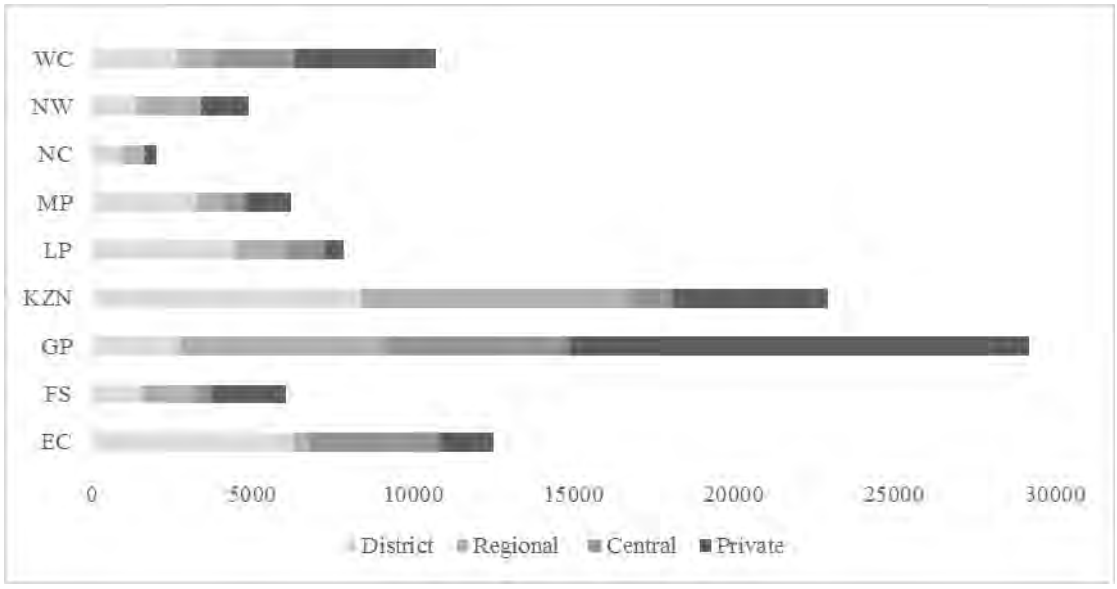
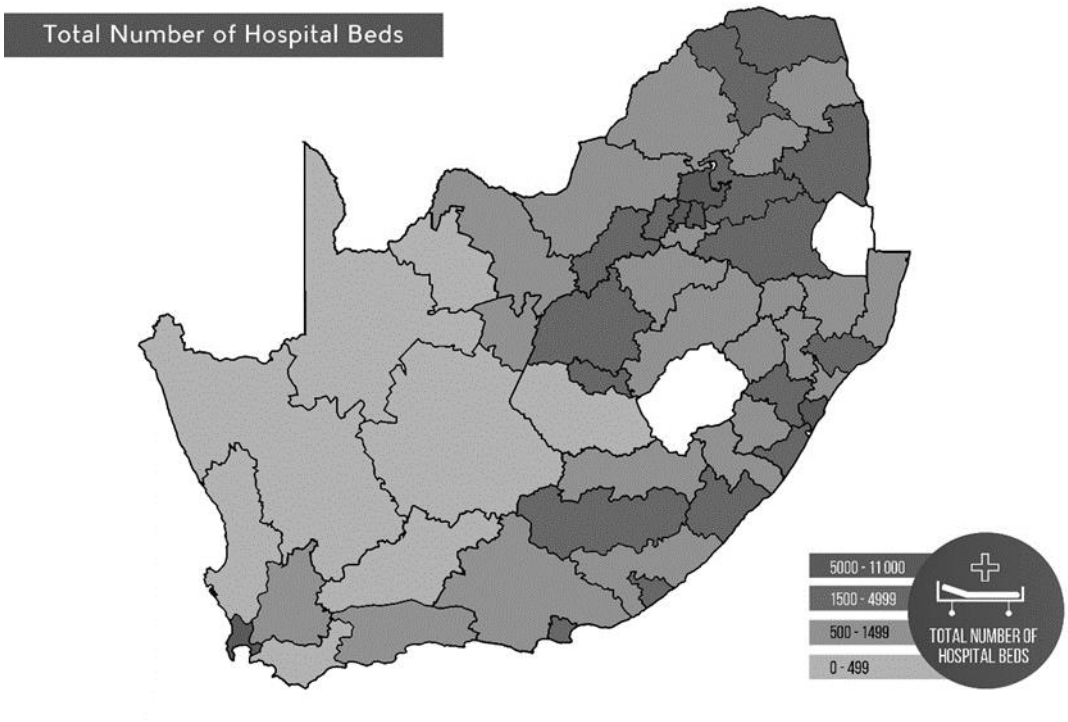
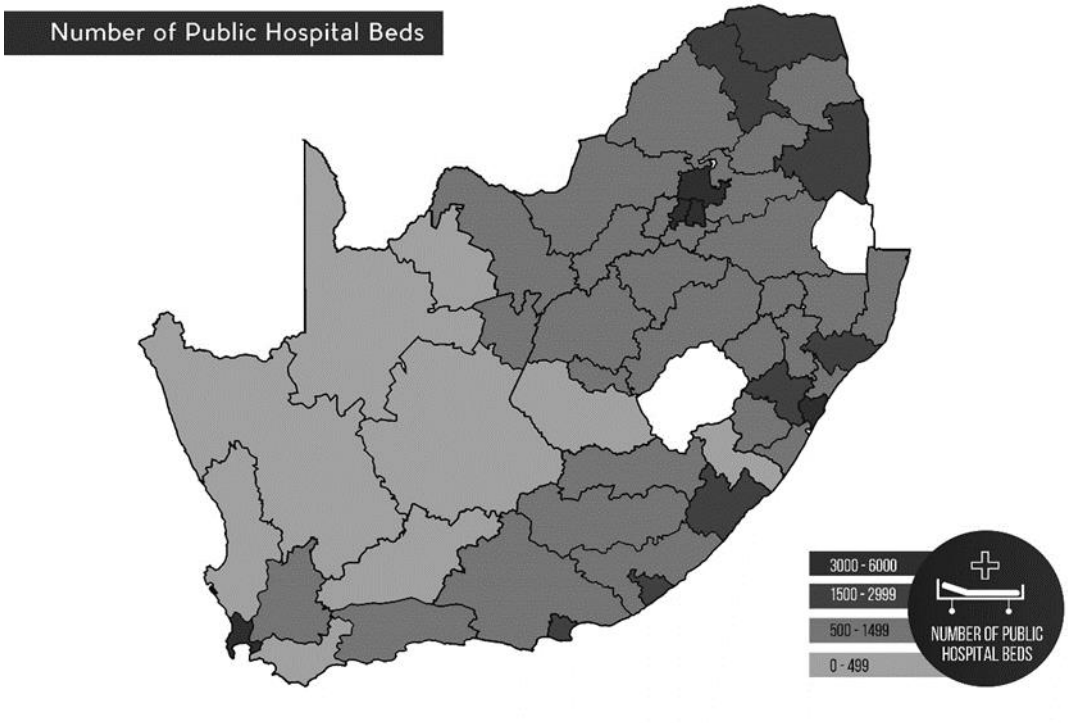


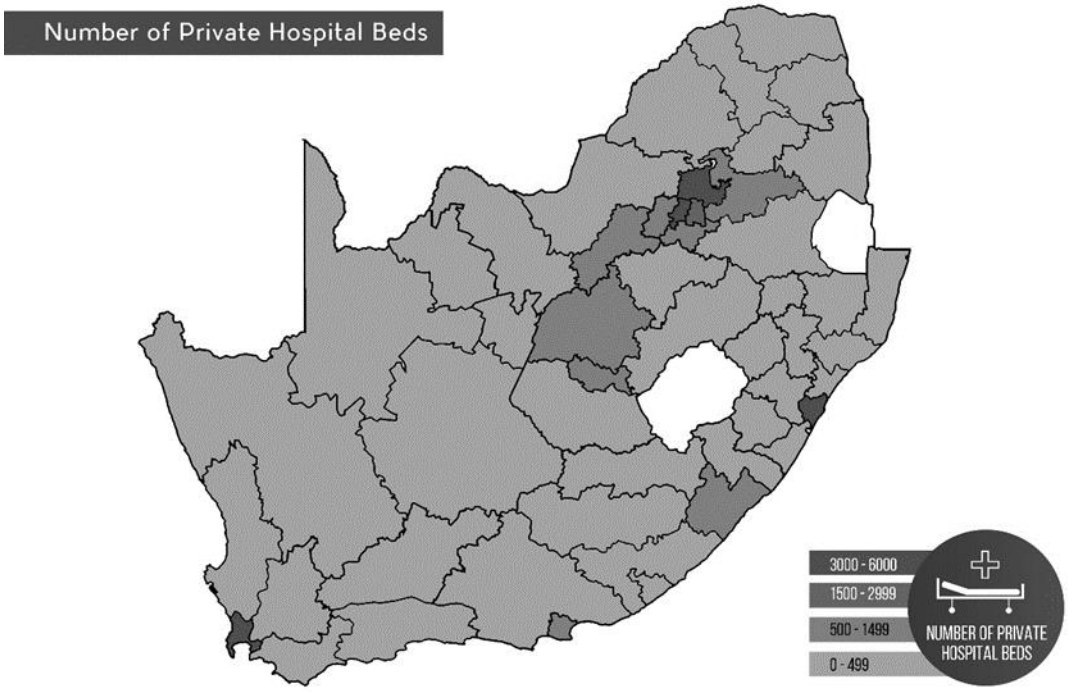
Figure 4: Total hospital bed number per province.



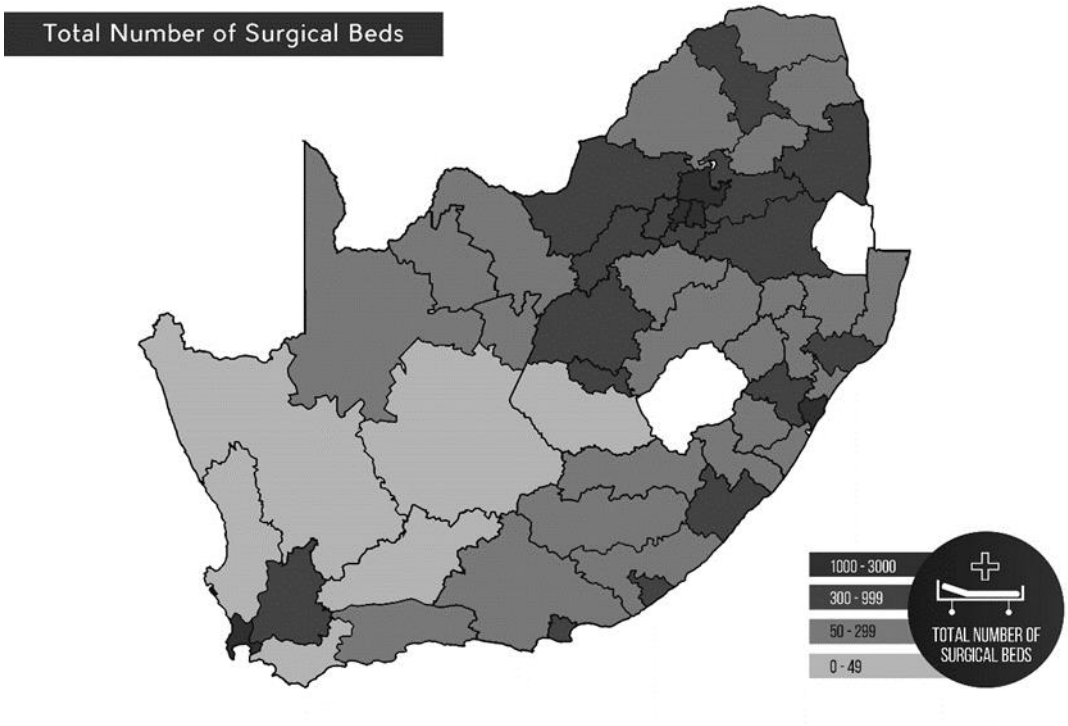
Map 7: Total hospital bed number according to district.



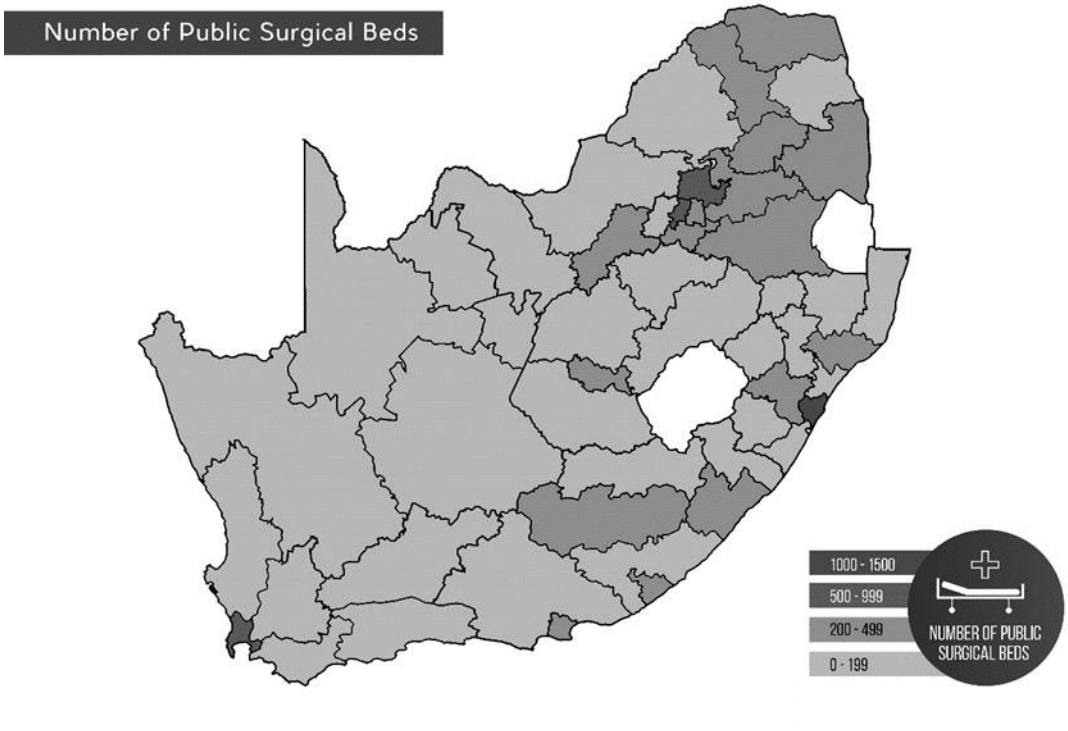
Map 8: Public hospital bed number according to district.



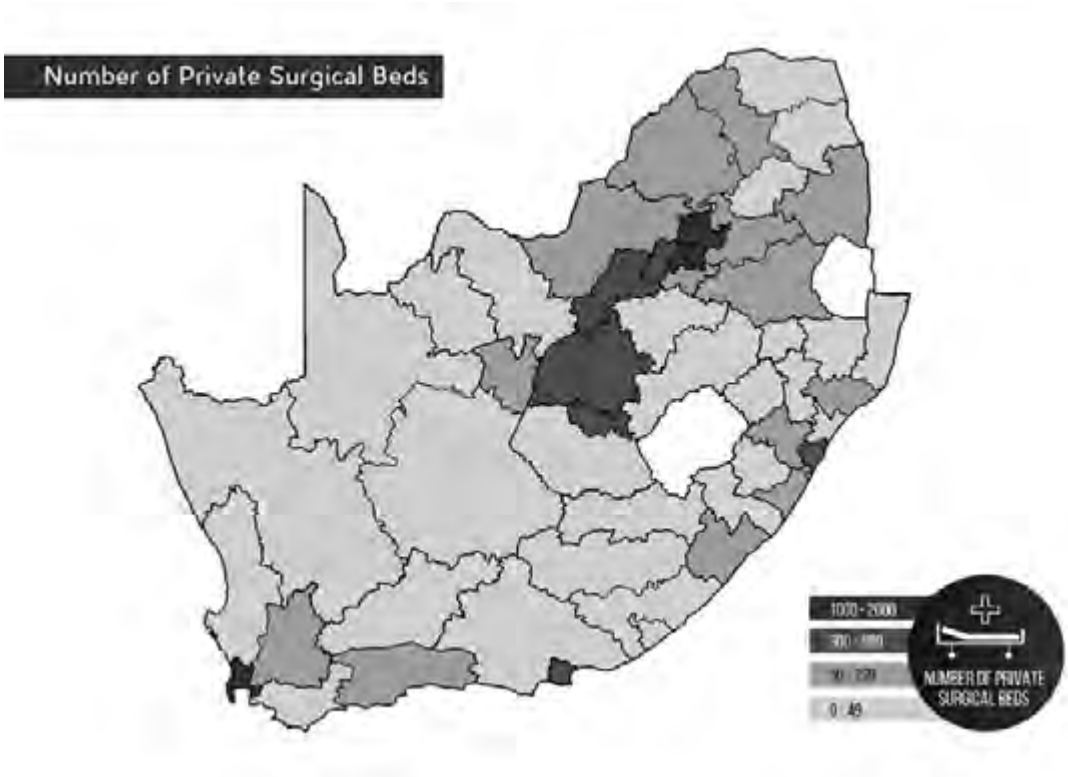
Map 9: Private hospital bed number according to district.



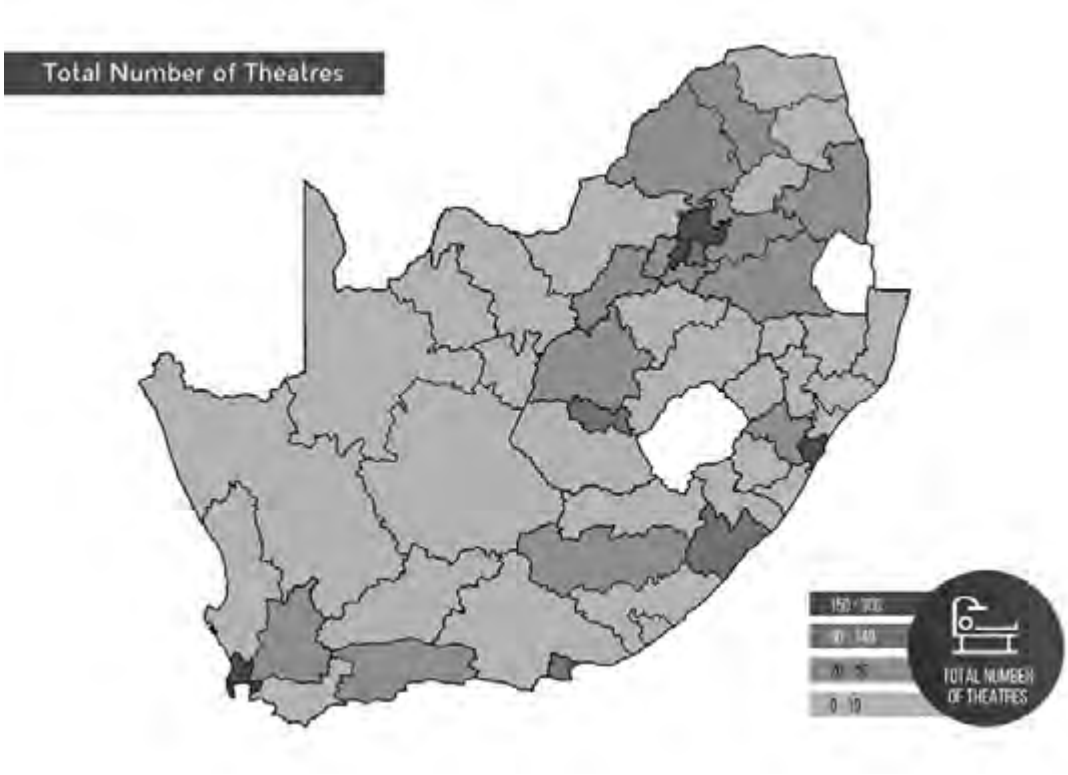
Map 10: Total number of surgical beds according to district.



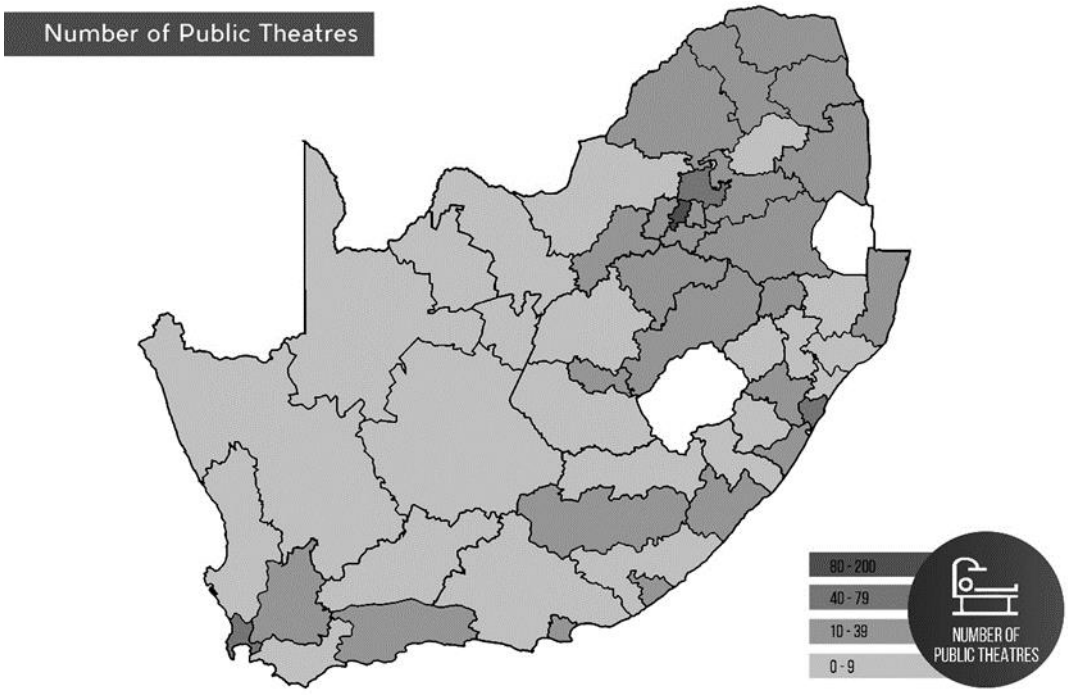
Map 11: Public sector surgical bed number according to district.



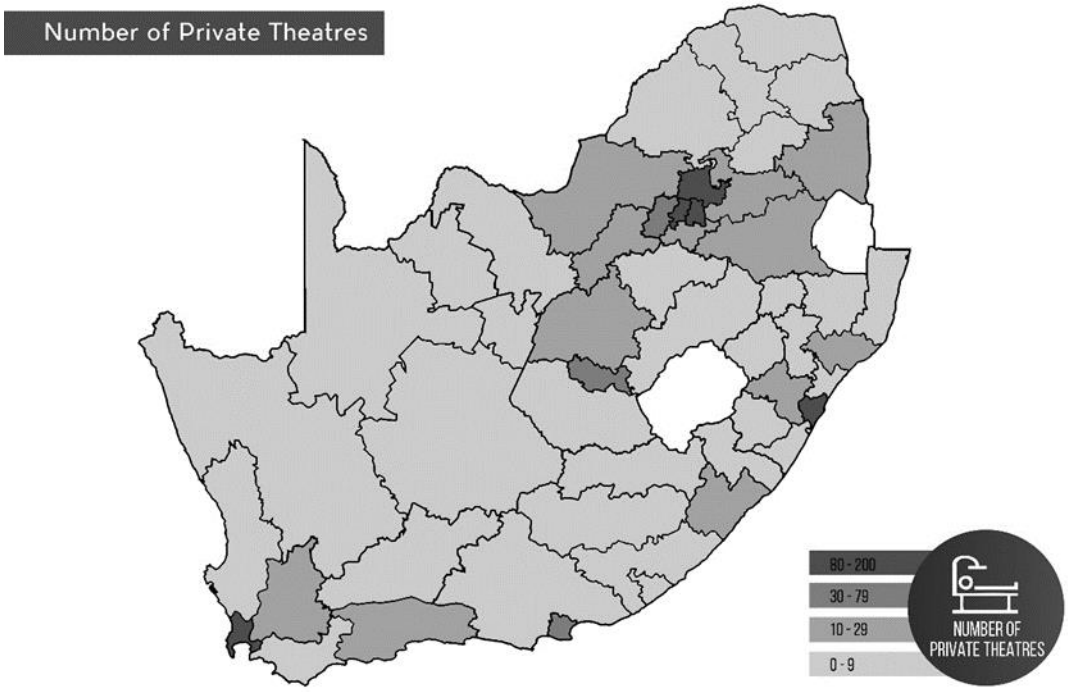
Map 12: Private sector surgical bed number according to district.



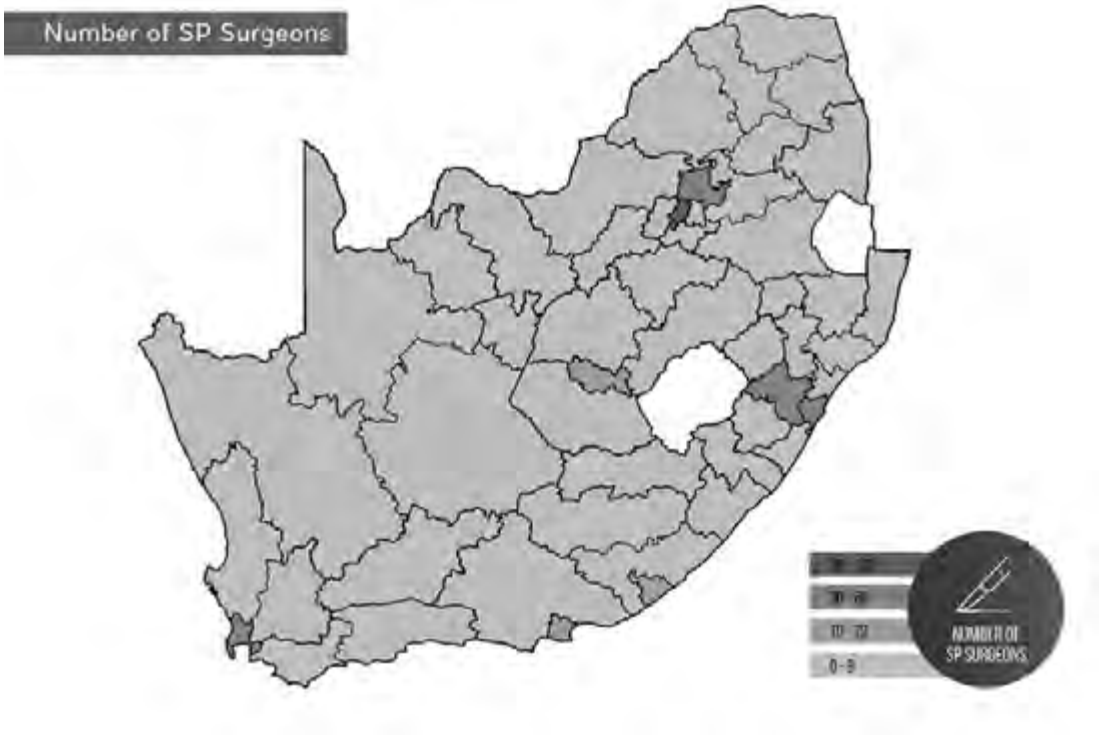
Map 13: Total operating theatre number according to district.



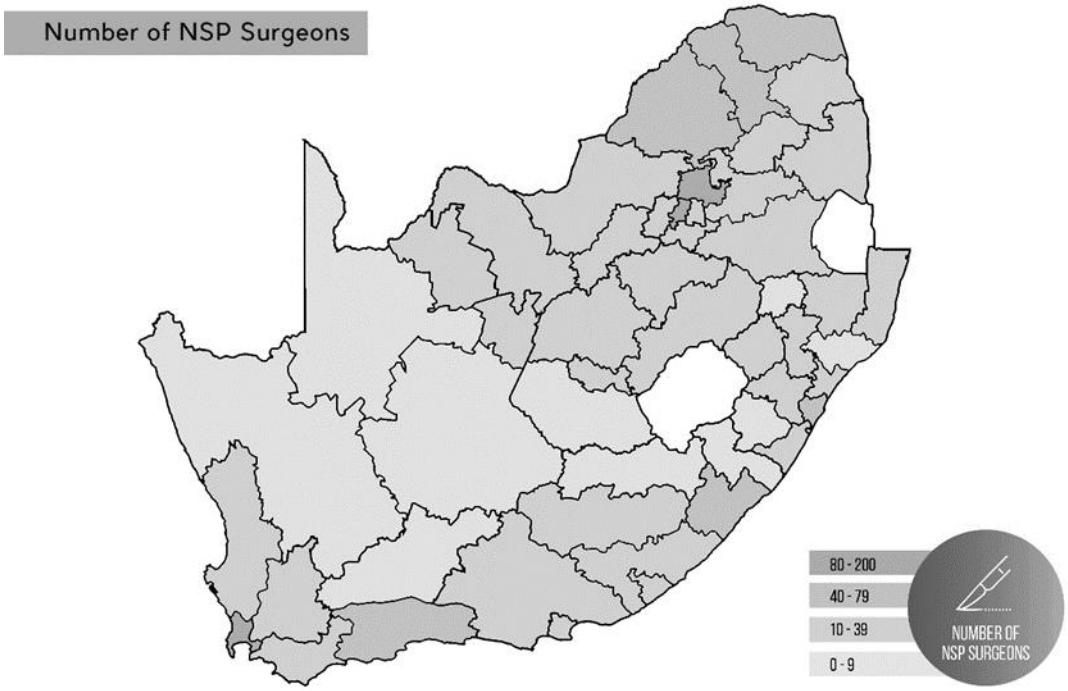
Map 14: Public operating theatre number according to district.



Map 15: Private operating theatre number according to district.



Map 16: Number of specialist general surgeons according to district.



Map 17: Number of non-specialist general surgeons according to district.

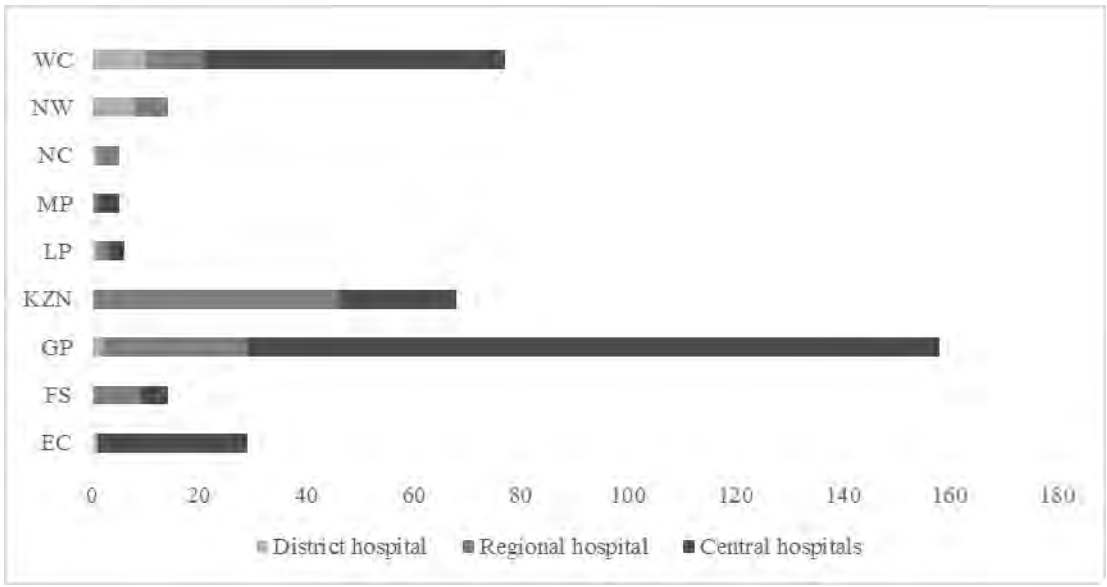


Figure 8: Specialist general surgeons by hospital level per province.

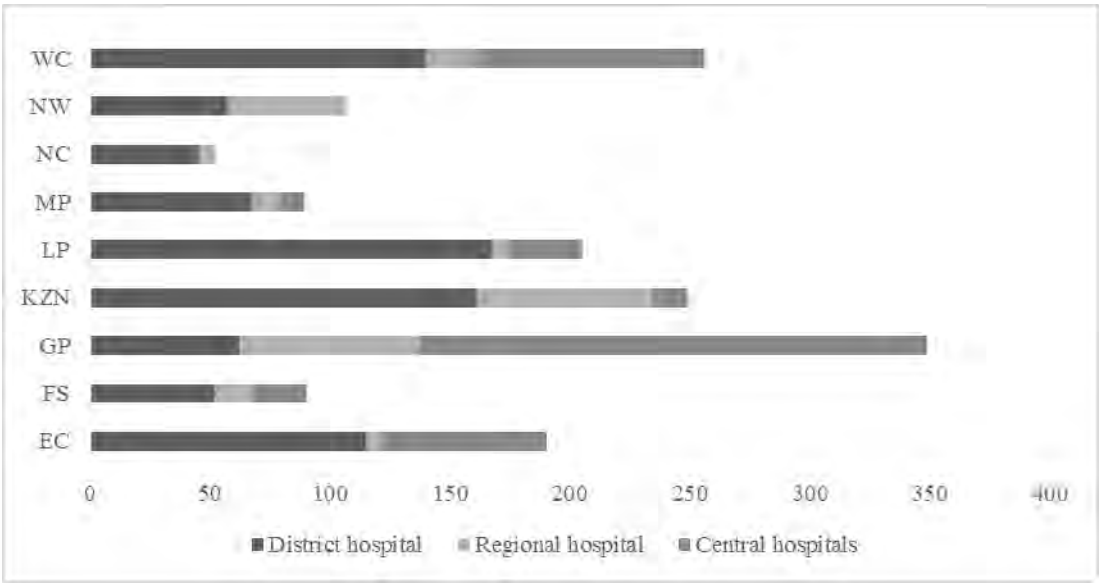


Figure 9: Non-specialist general surgeons by hospital level per province.

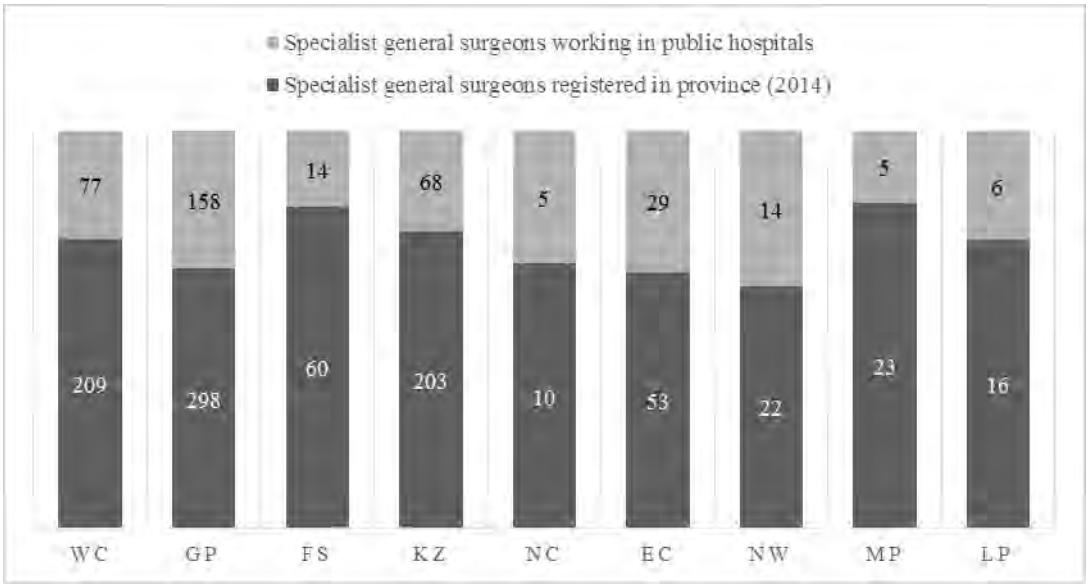


Figure 10: Proportion of specialist general surgeons working in public hospitals.

Table 33: Comparative of the number of surgical resources per district municipality.

Province	District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	SP Surgeons public sector	NSP Surgeons public sector	Public theatres	Private theatres
EC	Alfred Nzo	3	1	488	31	94	10	0	5	4	0
	Amathole	11	0	1 150	0	144	0	0	15	8	0
	Buffalo city	6	0	2 074	0	375	0	11	30	17	0
	C Hani	15	1	1 476	70	296	15	0	33	19	1
	Cacadu	10	3	603	97	65	25	1	23	6	3
	Joe Gqabi	11	0	537	0	53	0	0	8	8	0
	N Mandela	4	4	1 807	878	428	374	11	24	25	38
	O Tambo	15	5	2 698	610	435	213	6	52	31	18
FS	Fezile Dabi	5	4	596	137	100	40	2	19	10	6
	Lejweleputswa	6	4	680	1 167	125	353	1	17	9	17
	Mangaung	6	6	1 460	910	235	327	10	37	31	33
	T Mofutsanyane	10	2	907	111	159	44	1	17	14	4
	Xhariep	3	0	74	0	0	0	0	0	1	0
GP	Johannesburg	6	29	5 096	5 720	832	1 841	97	173	83	182
	Tshwane	8	23	4 140	3 919	846	1 270	51	100	64	159
	Ekurhuleni	6	18	3 212	2 776	343	1045	5	30	38	97
	Sedibeng	3	7	1 119	856	235	252	2	30	15	26
	West Rand	3	8	1 288	1 055	196	429	3	16	11	36

Table 33 continued: Comparative of the number of surgical resources per district municipality.

Province	District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	SP Surgeons (public sector)	NSP Surgeons (public sector)	Public theatres	Private theatres
KZN	Amajuba	3	1	1 146	138	168	36	2	6	10	5
	eThekwini	11	17	5 871	3 104	1 156	963	41	48	65	109
	iLembe	4	1	882	119	169	25	2	11	7	3
	Harry Gwala	4	2	716	139	154	37	0	7	9	4
	Ugu	4	3	1 143	388	193	83	2	19	10	9
	uMgungundlovu	4	3	1975	344	419	134	17	37	35	16
	uMkhanyakude	5	0	1 206	0	154	0	0	31	10	0
	uMzinyathi	4	0	1 032	0	165	0	0	32	8	0
	uThukela	3	1	929	105	170	34	1	14	9	3
	uThungulu	8	2	1 938	437	250	134	3	3	1	12
	Zululand	5	1	1 267	28	194	3	0	23	7	1
LP	Capricorn	8	1	1 851	247	284	105	3	51	19	8
	Sekhukhune	7	0	1 189	0	202	0	0	36	8	0
	Mopani	7	1	1 229	129	188	35	3	19	11	3
	Vhembe	7	1	1 786	22	235	6	0	49	11	1
	Waterberg	8	4	1 186	178	171	51	0	50	14	6
MP	Ehlanzeni	11	2	2 385	344	360	94	4	27	25	10
	G Sibande	9	5	1 292	434	283	156	0	35	19	12
	Nkangala	8	5	1 115	604	201	156	1	27	16	17

Table 33 continued: Comparative of the number of surgical resources per district municipality.

Province	District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	SP Surgeons (public sector)	NSP Surgeons (public sector)	Public theatres	Private theatres
NC	Frances Baard	5	1	833	252	158	91	4	19	7	8
	JT Gaetsewe	2	1	283	25	50	8	0	12	2	1
	Namakwa	2	1	102	34	11	10	0	9	3	1
	Pixley ka Seme	4	0	148	0	2	0	1	7	3	0
	ZF Mgcawu	4	1	288	50	71	17	0	5	2	2
NW	Bonjala	4	5	721	498	99	221	4	32	9	16
	RS Mompati	5	1	556	44	82	8	5	18	9	2
	NM Molema	5	1	869	93	210	45	2	24	9	3
	K Kaunda	4	7	1 266	830	236	302	3	33	19	24
WC	Winelands	6	4	827	465	156	160	5	27	16	17
	Central Karoo	4	0	120	0	11	0	0	7	4	0
	Cape town	12	21	4 144	3 324	821	1 199	65	107	70	130
	Eden	7	7	664	438	104	163	6	52	16	17
	Overberg	4	1	202	104	23	26	0	25	5	5
	West Coast	7	1	369	60	59	12	1	18	8	2

Table 34: Comparative of the number of surgical resources per 100 000 population, according to district municipality.

Province	District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	SP Surgeons (public sector)	NSP Surgeons (public sector)	Public theatres	Private theatres
EC	Alfred Nzo	0.37	0.12	59.39	3.77	11.44	1.22	0	0.61	0.49	0
	Amathole	1.23	0	128.79	0	16.13	0	0	1.68	0.90	0
	Buffalo city	0.79	0	275.35	0	49.79	0	1.46	3.98	2.26	0
	C Hani	1.87	0.12	183.78	8.72	36.86	0.12	0	4.11	2.36	0.12
	Cacadu	2.19	0.66	131.95	20.79	14.22	5.47	0.22	5.03	1.31	0.66
	Joe Gqabi	3.12	0	152.14	0	15.02	0	0	2.27	2.27	0
	N Mandela	0.34	0.34	153.89	74.77	36.45	31.85	0.94	2.04	2.13	3.24
	O Tambo	1.10	0.37	198.54	44.89	32.01	15.67	0.44	3.82	2.28	1.32
FS	Fezile Dabi	0.99	0.79	117.76	22.07	19.76	7.90	0.40	3.75	1.98	1.19
	Lejweleputswa	0.98	0.66	111.44	191.25	20.49	57.85	0.16	2.79	1.48	2.79
	Mangaung	0.78	0.78	189.20	117.93	30.45	42.38	1.30	4.80	4.02	4.28
	T Mofutsanyane	1.38	0.28	125.40	15.35	21.98	6.08	0.14	2.35	1.94	0.55
	Xhariep	2.11	0	52.15	0	0	0	0	0	0.70	0
GP	Johannesburg	0.13	0.62	109.75	123.19	17.92	39.65	2.09	3.72	1.78	3.92
	Tshwane	0.26	0.74	134.00	126.86	27.38	41.11	1.65	3.23	2.07	5.14
	Ekurhuleni	0.19	0.56	99.40	85.91	10.62	32.34	0.15	0.93	1.17	3.00
	Sedibeng	0.33	0.76	122.25	93.52	25.67	27.53	0.22	3.28	1.64	2.84
	West Rand	0.35	0.94	151.62	124.19	22.80	50.50	0.35	1.88	1.29	4.23

Table 34 continued: Comparative of the number of surgical resources per 100 000 population, according to district municipality.

Province	District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	SP Surgeons (public sector)	NSP Surgeons (public sector)	Public theatres	Private theatres
KZN	Amajuba	0.59	0.20	225.83	27.19	33.11	7.09	0.39	1.18	1.97	0.99
	eThekwini	0.32	0.49	169.48	89.60	33.37	27.80	1.18	1.39	1.88	3.15
	iLembe	0.63	0.16	186.90	18.87	26.80	3.97	0.32	1.74	1.11	0.48
	Harry Gwala	0.85	0.42	151.73	29.46	32.63	7.84	0	1.48	1.91	0.85
	Ugu	0.55	0.41	155.89	52.91	26.32	11.32	0.27	2.59	1.36	1.23
	uMgungundlovu	0.04	0.28	187.60	32.68	39.80	12.73	1.64	3.51	3.32	1.52
	uMkhanyakude	0.78	0	189.02	0	24.14	0	0	4.85	1.57	0
	uMzinyathi	0.78	0	200.69	0	32.09	0	0	6.22	1.56	0
	uThukela	0.44	0.15	136.06	15.38	24.90	4.98	0.15	2.05	1.32	0.44
	uThungulu	0.85	0.21	206.66	46.60	26.66	14.29	0.32	0.32	1.81	1.28
	Zululand	0.61	0.12	153.75	3.40	23.44	0.36	0	2.79	0.85	0.12
LP	Capricorn	0.63	0.08	146.36	19.53	22.46	8.30	0.24	4.03	1.50	0.63
	Sekhukhune	0.63	0	107.40	0	18.25	0	0	3.25	0.72	0
	Mopani	0.62	0.08	109.50	11.49	16.75	3.12	0.27	1.69	0.98	0.27
	Vhembe	0.53	0.08	134.50	1.66	14.16	0.45	0	3.69	0.83	0.08
	Waterberg	1.12	0.56	167.35	25.12	24.13	7.20	0	7.06	1.98	0.85
MP	Ehlanzeni	0.64	0.12	139.14	20.07	21.00	5.48	0.23	1.56	1.46	0.58
	G Sibande	0.85	0.47	122.33	41.09	26.79	14.77	0	3.31	1.80	1.14
	Nkangala	0.59	0.37	82.12	44.49	14.80	11.49	0.07	1.99	1.18	1.25

Table 34 continued: Comparative of the number of surgical resources per 100 000 population, according to district municipality.

Province	District	Public hospitals	Private hospitals	Public hospital beds	Private hospital beds	Public surgical beds	Private surgical beds	SP Surgeons (public sector)	NSP Surgeons (public sector)	Public theatres	Private theatres
NC	Frances Baard	1.31	0.26	219.58	66.43	41.64	23.99	1.05	5.00	1.85	2.10
	JT Gaetsewe	0.87	0.43	122.54	10.83	21.65	3.47	0	5.20	0.87	0.43
	Namakwa	1.69	0.84	86.11	28.70	9.20	8.44	0	7.60	2.53	0.84
	Pixley ka Seme	2.11	0	77.89	0	1.05	0	0.53	3.68	1.58	0
	ZF Mgcawu	1.64	0.41	117.96	20.48	29.08	6.96	0	2.05	0.82	0.82
NW	Bonjala	0.26	0.31	46.61	31.81	6.32	4.11	0.26	2.04	0.57	1.02
	RS Mompati	1.06	0.21	117.79	9.32	17.34	1.70	1.06	3.81	1.90	0.42
	NM Molema	0.59	0.12	101.92	10.91	24.62	5.28	0.24	2.81	1.06	0.35
	K Kaunda	0.57	0.99	178.95	117.32	33.36	42.69	0.43	4.66	2.69	3.39
WC	Winelands	0.74	0.50	102.35	57.54	19.31	19.80	0.62	3.34	1.98	2.10
	Central Karoo	5.62	0	168.46	0	15.44	0	0	9.83	5.61	0
	Cape town	0.31	0.54	107.34	86.10	21.27	31.06	1.68	2.77	1.81	3.37
	Eden	1.20	1.19	113.34	74.76	17.75	27.82	1.02	8.88	2.73	2.90
	Overberg	1.65	0.41	74.10	38.15	8.44	9.54	0	9.17	1.83	1.83
	West Coast	1.67	0.24	88.15	14.33	14.09	2.87	0.24	4.30	1.91	0.48

20.7 **Appendix G:** Chapter 5 Figures and Tables (Eastern Cape Province)

Table 37: Eastern Cape provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
A Nzo	District	Madzikane kaZulu	223	48	0	2	1
A Nzo	District	Mount Ayliff	99	20	0	0	1
A Nzo	District	Tayler Bequest (Matatiele)	166	26	0	3	2
Amathole	District	Adelaide	60	15	0	3	1
Amathole	District	Bedford	60	0	0	1	1
Amathole	District	Butterworth	269	52	0	4	2
Amathole	District	Cathcart	33	0	0	0	0
Amathole	District	Fort Beaufort	70	15	0	2	1
Amathole	District	Komga	15	0	0	0	0
Amathole	District	Nompumelelo	180	30	0	2	1
Amathole	District	SS Gida	122	32	0	2	1
Amathole	District	Stutterheim	70	0	0	0	0

Table 37 continued: Eastern Cape provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
Amathole	District	Tafalofefe	161	0	0	0	0
Amathole	District	Victoria (Alice)	110	0	0	1	1
Buffalo City	District	Grey	67	18	0	4	1
Buffalo City	District	Bhisho	205	40	0	3	2
Buffalo City	District	Madwaleni	180	0	0	2	1
Buffalo City	District	Newhaven	45	0	0	0	0
Buffalo City	Tertiary	Cecilia Makiwane	737	130	6	7	5
Buffalo City	Tertiary	Frere	840	187	5	14	8
C Hani	District	All Saints	244	48	0	7	2
C Hani	District	Cala	64	16	0	9	2
C Hani	District	Cofimvaba	140	28	0	0	1
C Hani	District	Cradock	83	0	0	0	1
C Hani	District	Dordrecht	35	0	0	0	0
C Hani	District	Elliot	52	20	0	2	1
C Hani	District	Glen Grey	151	0	0	0	1
C Hani	District	Hewu	208	80	0	4	2
C Hani	District	Indwe	31	0	0	0	0

Table 37 continued: Eastern Cape provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
C Hani	District	Martje Venter (Tarkastad)	20	0	0	0	0
C Hani	District	Mjanyana	100	22	0	2	1
C Hani	District	Molteno	25	0	0	0	1
C Hani	District	Sterkstroom	8	0	0	0	0
C Hani	District	Wilhelm Stahl (Middelburg)	32	10	0	5	2
C Hani	Regional	Frontier	283	72	0	4	5
Cacadu	District	Aberdeen	18	0	0	0	0
Cacadu	District	Andries Vosloo	74	16	0	8	1
Cacadu	District	BJ Vorster (Kareedouw)	42	0	0	0	0
Cacadu	District	Humansdorp (Kouga partnership)	80	0	0	5	1
Cacadu	District	Midland	80	0	0	3	1
Cacadu	District	Port Alfred	31	15	0	5	2
Cacadu	District	SAWAS Memorial (Jansenville)	38	6	0	0	0
Cacadu	District	Settlers	178	20	1	2	1
Cacadu	District	Sundays Valley (Kirkwood)	37	8	0	0	0
Cacadu	District	Willowmore	25	0	0	0	0

Table 37 continued: Eastern Cape provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
Joe Gqabi	District	Aliwal North	48	10	0	0	1
Joe Gqabi	District	Burgersdorp	24	0	0	0	1
Joe Gqabi	District	Cloete Joubert (Barkly East)	25	0	0	0	0
Joe Gqabi	District	Empilisweni	93	15	0	2	2
Joe Gqabi	District	Jamestown	10	0	0	0	0
Joe Gqabi	District	Lady Grey	30	0	0	0	1
Joe Gqabi	District	Maclear	38	12	0	0	0
Joe Gqabi	District	St Francis	26	0	0	0	0
Joe Gqabi	District	Steynsburg	28	0	0	0	0
Joe Gqabi	District	Taylor Bequest (Elundini)	141	16	0	4	1
Joe Gqabi	District	Umlamli	74	0	0	2	2
N Mandela	District	Uitenhage	223	40	0	2	3
N Mandela	Tertiary	Dora Nginza	650	0	0	0	4
N Mandela	Tertiary	Livingstone	583	180	11	22	8
N Mandela	Tertiary	Port Elizabeth Provincial	351	208	0	0	10
O Tambo	District	Bambisana	120	0	0	0	1

Table 37 continued: Eastern Cape provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
O Tambo	District	Canzibe	140	0	0	0	1
O Tambo	District	Dr Malizo Mpehle Memorial	155	30	0	0	1
O Tambo	District	Greenville	100	0	0	4	1
O Tambo	District	Holy Cross	224	0	0	1	1
O Tambo	District	Isilimela	110	0	0	2	1
O Tambo	District	Nessie Knight	150	30	0	2	1
O Tambo	District	Sipetu (Ntabankulu)	120	30	0	2	1
O Tambo	District	St Barnabas	169	0	0	0	0
O Tambo	District	St Lucy's	40	0	0	0	0
O Tambo	District	St Patrick's	100	0	0	0	1
O Tambo	District	Zitulele	130	25	0	13	1
O Tambo	Provincial Tertiary	Mthatha General	348	60	4	10	7
O Tambo	Provincial Tertiary	Nelson Mandela Academic	520	180	2	16	11
O Tambo	Regional	St Elizabeth's	272	80	0	2	3
	Total	75	10 833	1 890	29	190	118

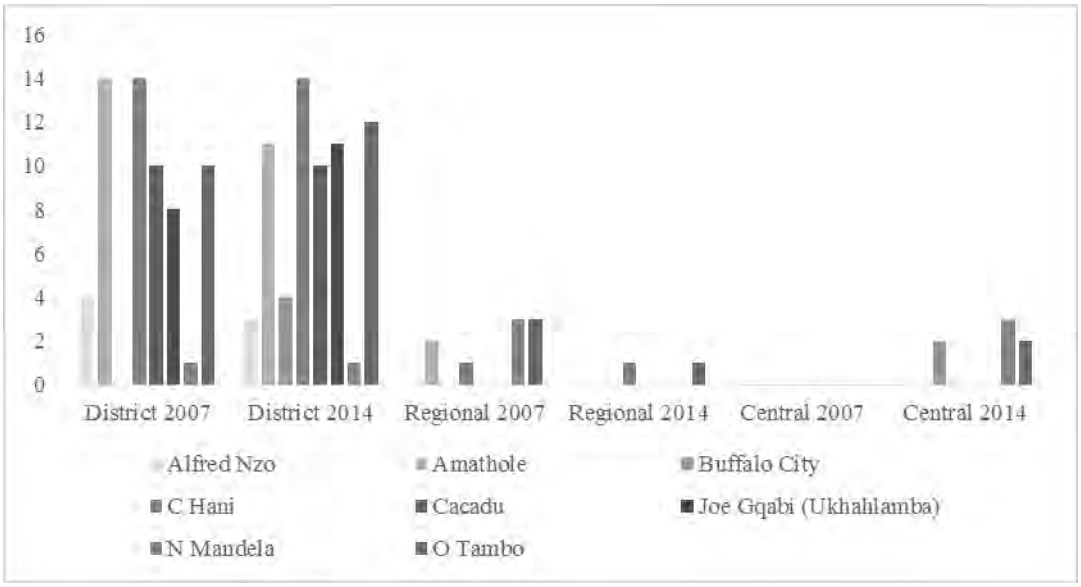


Figure 11: Comparative between Eastern Cape public hospital number for 2007 and 2014.

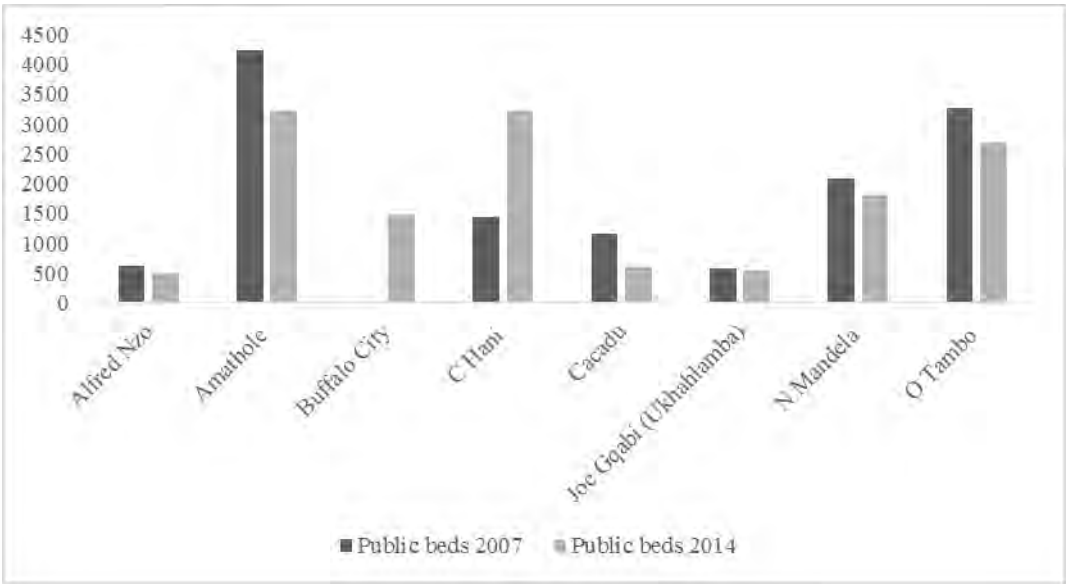


Figure 12: Comparative between Eastern Cape public hospital beds for 2007 and 2014.

Table 42: Eastern Cape private hospitals with total hospital beds, surgical beds and theatres.

Region	Owner	Hospital	Usable beds	Surgical beds	Theatres
A Nzo	Independent	Matatiele Private	31	10	0
Amathole		nil			
Buffalo City		nil			
C Hani	Life	Life Queenstown	70	15	1
Cacadu	Life	Life Isivivana	33	12	1
Cacadu	Netcare	Netcare Port Alfred	30	14	2
Cacadu	Netcare	Netcare Settler's	32	25	3
Joe Gqabi		nil			
N Mandela	Life	Life St George's	216	106	14
N Mandela	Life	Life Mercantile Private	202	59	5
N Mandela	Netcare	Netcare Greenacres	340	157	14
N Mandela	Netcare	Netcare Cuyler	120	52	5
O Tambo	Life	Life St Mary's Private	131	38	3
O Tambo	Life	Life East London Private	100	0	0
O Tambo	Life	Life St Dominic's	183	76	5
O Tambo	Life	Life St James	28	28	4
O Tambo	Life	Life Beacon bay	168	71	6
	Total	13	1 684	663	63

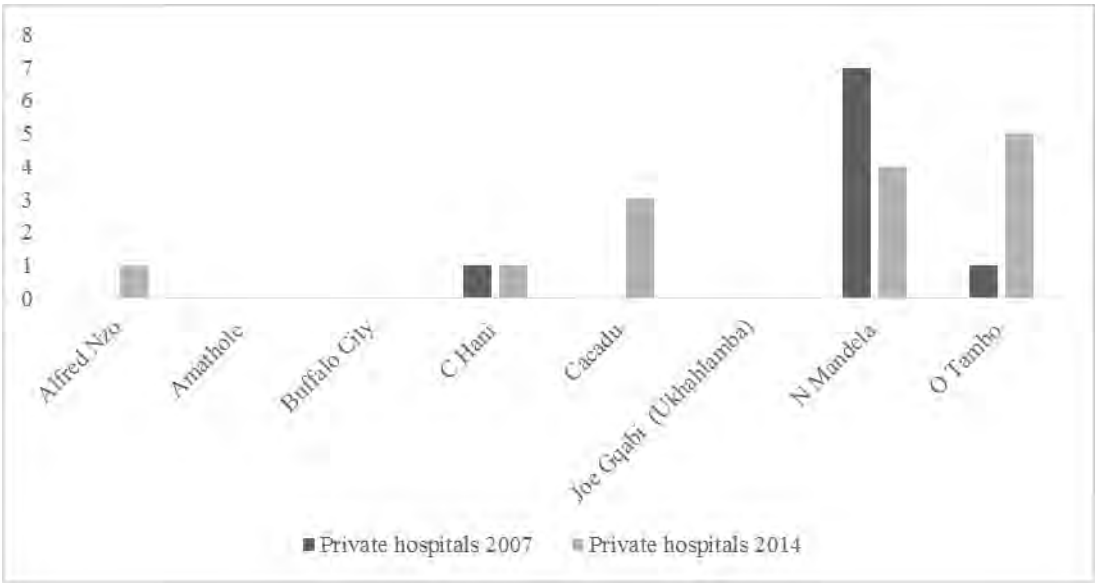


Figure 14: Comparative between Eastern Cape private hospital number for 2007 and 2014.

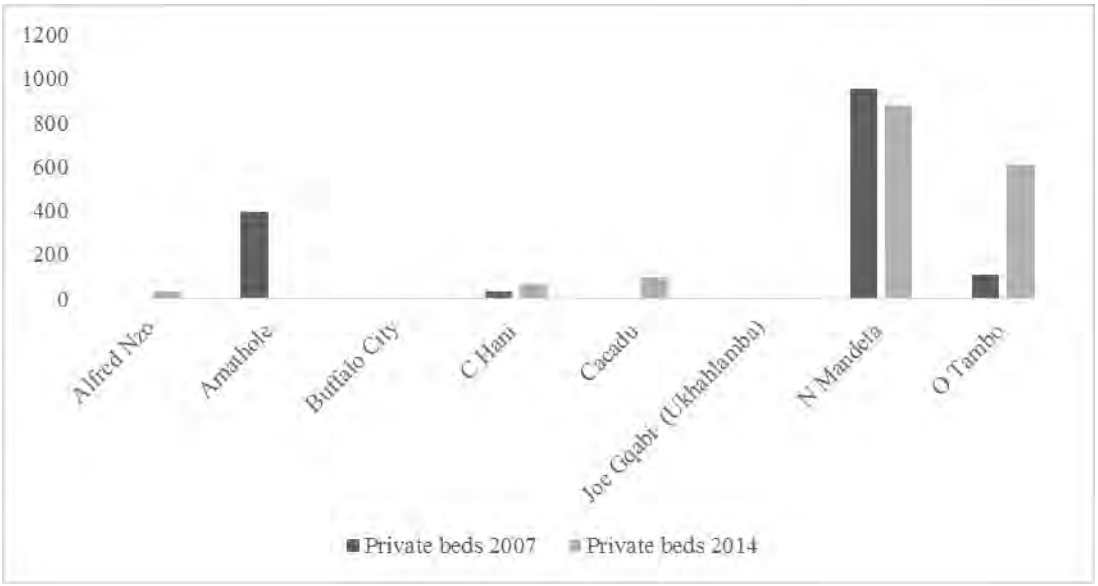


Figure 15: Comparative between Eastern Cape private hospital bed number for 2007 and 2014.

20.8 **Appendix H:** Chapter 6 Figures and Tables (Free State Province)

Table 48: Free State provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons non-specialist	Theatres
Fezile Dabi	District	Mafube	74	0	0	4	1
Fezile Dabi	District	Metsimaholo	82	30	0	5	1
Fezile Dabi	District	Parys	50	0	0	4	1
Fezile Dabi	District	Tokollo	78	10	0	3	1
Fezile Dabi	Regional	Boitumelo	312	60	2	3	6
Lejweleputswa	District	Katleho/Winburg	78	4	0	6	2
Lejweleputswa	District	Mohau	28	0	0	1	1
Lejweleputswa	District	Nala	36	0	0	1	1
Lejweleputswa	District	Thusanong	86	0	0	5	1
Lejweleputswa	District	Winburg	32	3	0	0	0
Lejweleputswa	Regional	Bongani	420	118	1	4	4
Mangaung	District	Botshabelo	135	40	0	3	2
Mangaung	District	Dr JS Moroka	137	38	0	3	1
Mangaung	District	Mantsopa	100	20	0	2	1
Mangaung	District	National	76	25	0	3	3
Mangaung	National Central	Universitas	543	60	5	22	17
Mangaung	Regional	Pelonomi	469	52	5	4	7

Table 48 continued: Free State provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons non-specialist	Theatres
T Mofutsanyane	District	Elizabeth Ross	110	24	0	6	1
T Mofutsanyane	District	Itemoheng	25	0	0	0	1
T Mofutsanyane	District	John Daniel Newberry	30	6	0	2	1
T Mofutsanyane	District	Nketoana	45	0	0	0	1
T Mofutsanyane	District	Phekolong	85	15	0	0	1
T Mofutsanyane	District	Phumelela	81	0	0	0	1
T Mofutsanyane	District	Phuthuloha	55	8	0	0	0
T Mofutsanyane	District	Thebe	71	0	0	4	1
T Mofutsanyane	Regional	Dihlabeng	135	38	1	1	3
T Mofutsanyane	Regional	Mofumahadi Manapo Mopeli	270	68	0	4	4
Xhariep	District	Diamond/Diamant	28	0	0	0	1
Xhariep	District	Embekweni	23	0	0	0	0
Xhariep	District	Stoffel Coetzee	23	0	0	0	0
	Total	30	3 717	619	14	90	65

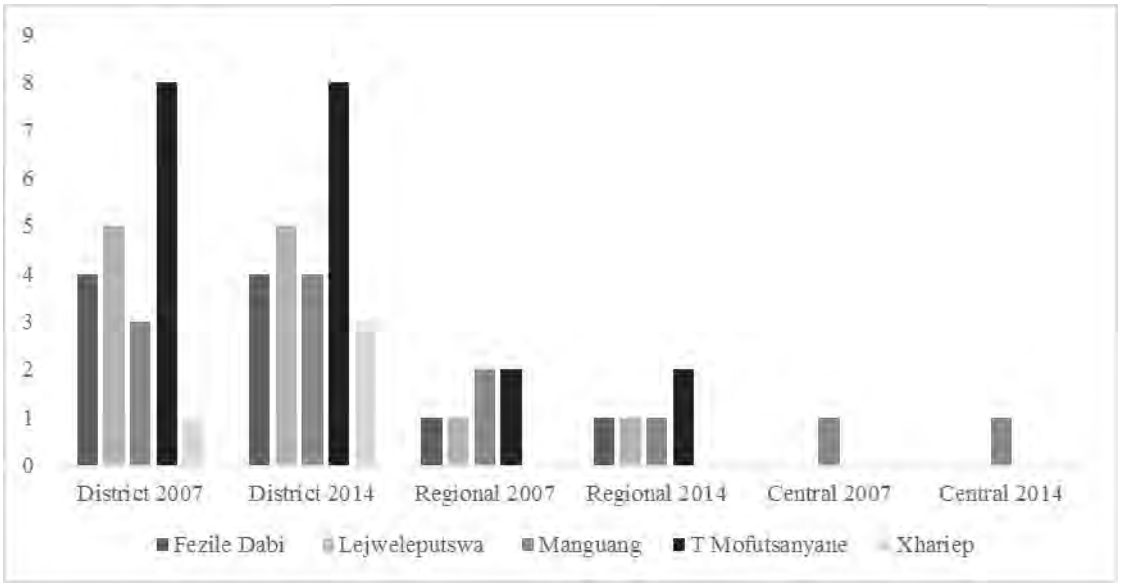


Figure 16: Comparative between Free State public hospital number for 2007 and 2014.

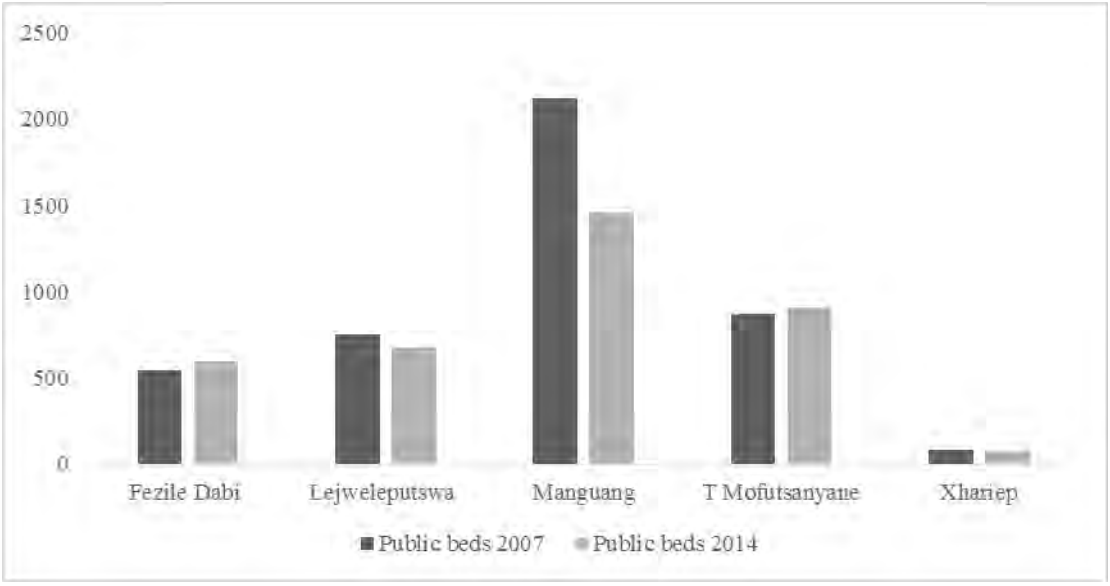


Figure 17: Comparative between Free State public hospital beds for 2007 and 2014.

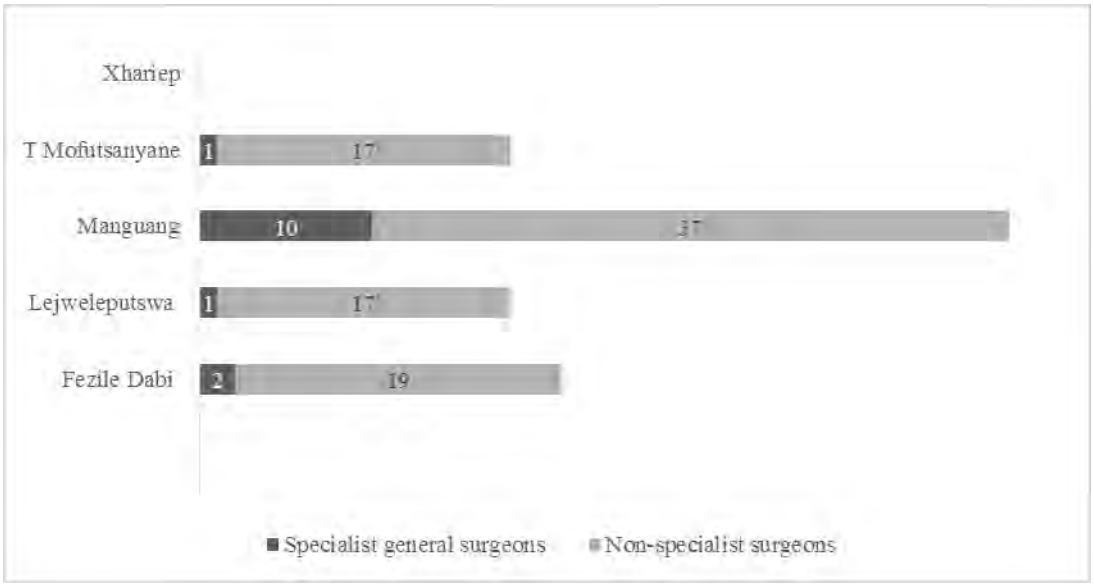


Figure 18: Free State public specialist and non-specialist general surgeons by district.

Table 53: Free State private hospitals with total hospital beds, surgical beds and theatres.

Region	Owner	Hospital	Usable beds	Surgical beds	Theatres
Fezile Dabi	Netcare	Netcare Kroon	80	12	2
Fezile Dabi	Independent	Riemland	10	3	1
Fezile Dabi	Independent	Sasol Infrachem	11	7	0
Fezile Dabi	Netcare	Netcare Vaalpark	36	18	3
Lejweleputswa	Independent	Ernest Oppenheimer	695	197	4
Lejweleputswa	Mining	Harmony Goldmine	150	54	3
Lejweleputswa	Independent	St Helena	131	42	2
Lejweleputswa	Mediclinic	Welkom Mediclinic	191	60	8
Mangaung	Life	Life Rosepark	235	50	10
Mangaung	Independent	Hospital Park Hospital	64	30	3
Mangaung	Independent	Citymed day theatre	20	20	2
Mangaung	Mediclinic	Bloemfontein Mediclinic	377	148	12
Mangaung	Netcare	Pelanomi hospital Netcare	87	19	2
Mangaung	Netcare	Universitas Hospital Netcare	127	60	4
T Mofutsanyane	Mediclinic	Hoogeland Mediclinic	107	40	3
T Mofutsanyane	Independent	Bethlehem medical centre Day	4	4	1
Xhariep		nil			
	Total	16	2 325	764	60

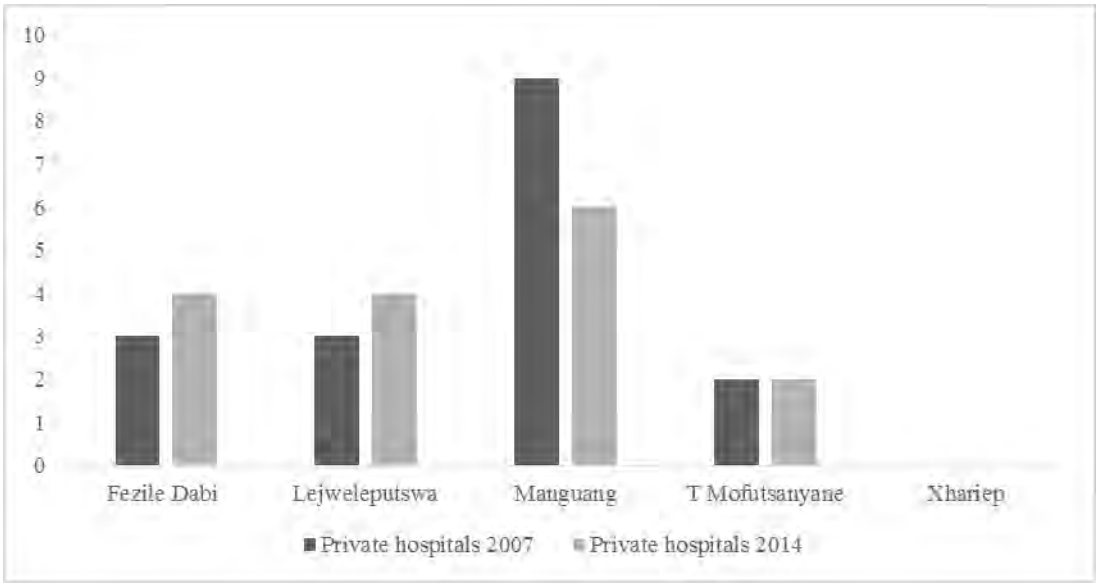


Figure 19: Comparative between Free State private hospital number for 2007 and 2014.

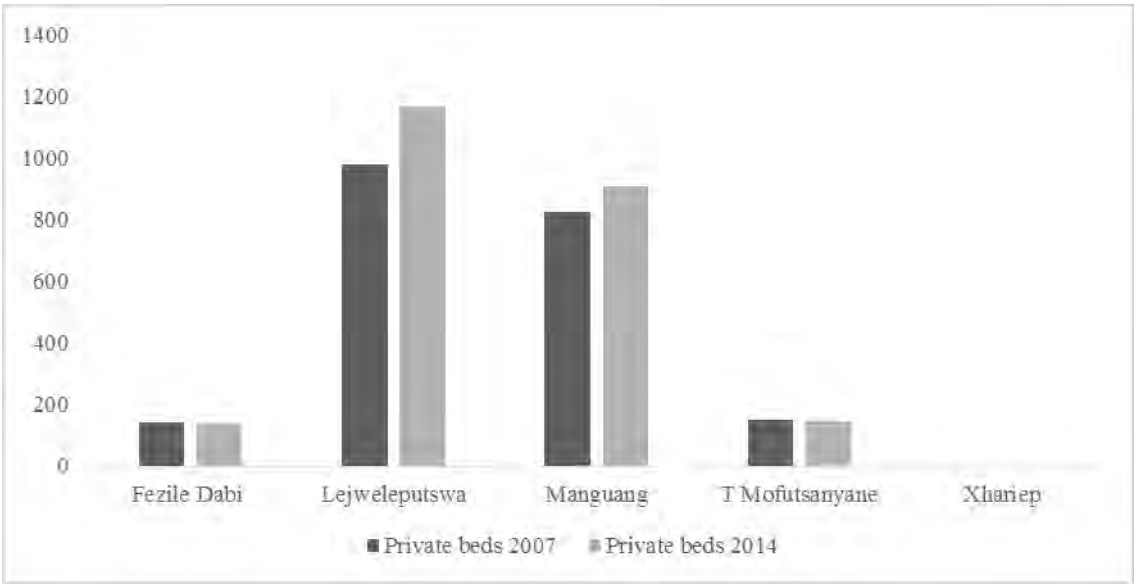


Figure 20: Comparative between Free State private hospital bed number for 2007 and 2014.

20.9 **Appendix I:** Chapter 7 Figures and Tables (Gauteng Province)

Table 59: Gauteng provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital Type	Hospital	Usable Beds	Surgical Beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
Ekurhuleni	District	Germiston	230	12	0	0	4
Ekurhuleni	Regional	Far East Rand	345	89	1	8	6
Ekurhuleni	Regional	Natalspruit	800	0	0	0	8
Ekurhuleni	Regional	Pholosong	483	36	1	7	3
Ekurhuleni	Regional	Tambo Memorial	518	86	2	8	6
Ekurhuleni	Regional	Tembisa	836	120	1	7	11
Johannesburg	District	South Rand	275	53	0	1	2
Johannesburg	National Central	Charlotte Maxeke	1066	72	16	34	34
Johannesburg	National Central	Chris Hani Baragwanath	2639	547	72	127	30
Johannesburg	Regional	Edenvale	230	40	1	2	3
Johannesburg	Regional	Helen Joseph	576	120	8	9	9
Johannesburg	Regional	Raheema Moosa	310	0	0	0	5
Sedibeng	District	Heidelberg	126	23	0	12	2

Table 59 continued: Gauteng provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital Type	Hospital	Usable Beds	Surgical Beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
Sedibeng	District	Kopanong	248	24	0	8	2
Sedibeng	Regional	Sebokeng	745	188	2	10	11
Tshwane	District	Jubilee	446	84	0	4	3
Tshwane	District	Mamelodi	356	32	1	6	6
Tshwane	District	Odi	216	60	0	9	3
Tshwane	District	Pretoria West	153	30	1	14	2
Tshwane	District	Tshwane	197	40	0	5	4
Tshwane	National Central	Dr George Mukhari	1236	148	24	24	17
Tshwane	National Central	Steve Biko Academic	780	81	17	27	18
Tshwane	Regional	Kalafong	756	371	8	11	11
West Rand	District	Carletonville	230	50	0	1	2
West Rand	District	Dr Yusuf Dadoo	245	20	0	2	1
West Rand	Regional	Leratong	813	126	3	13	8
	Total	26	14 855	2 452	158	349	211

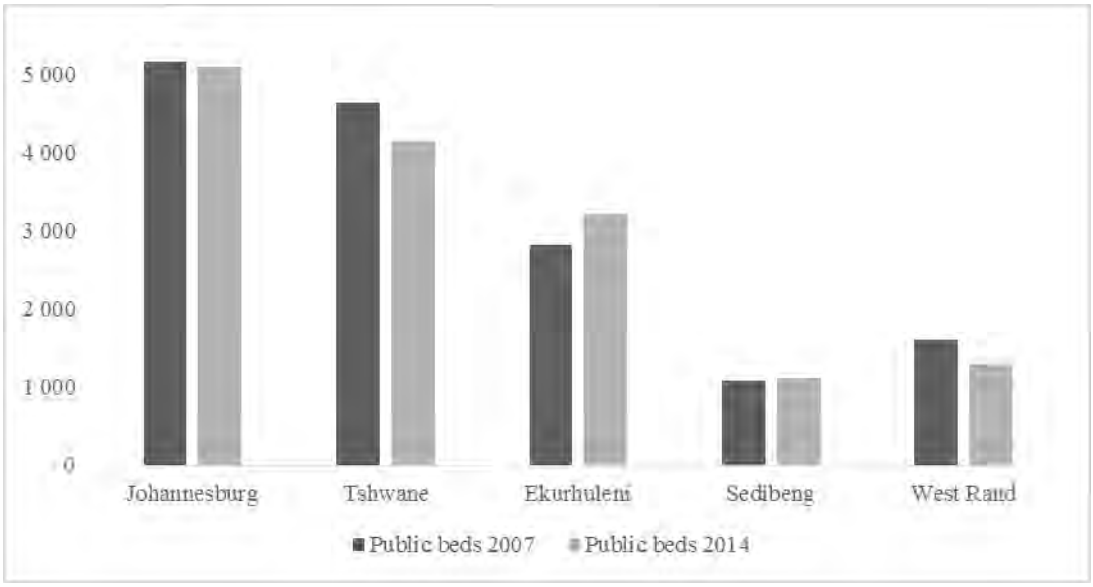


Figure 22: Comparative between Gauteng public hospital beds for 2007 and 2014.

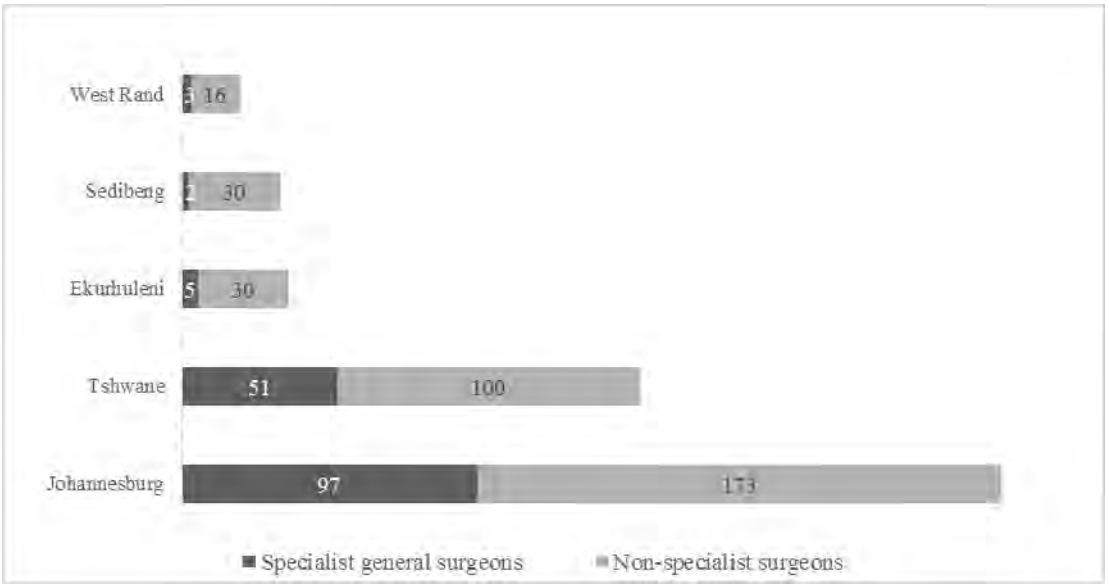


Figure 23: Gauteng public hospital specialist and non-specialist general surgeons by district.

Table 64: Gauteng private hospitals with total hospital beds, surgical beds and operating theatres.

Region	Owner	Hospital	Usable beds	Surgical beds	Theatres
Ekurhuleni	Independent	Actonville/Sunshine	200	5	5
Ekurhuleni	Life	Bedford Gardens Private	140	31	6
Ekurhuleni	Independent	Birchmed Surgical Centre	21	21	3
Ekurhuleni	Clinix	Vosloorus/ Botshelong-Empilweni	104	40	3
Ekurhuleni	Netcare	Clinton Clinic Netcare	165	99	5
Ekurhuleni	Life	Dalview Clinic	75	27	4
Ekurhuleni	Netcare	East Rand N17 Private Netcare	171	70	5
Ekurhuleni	Independent	Arwyp Medical Centre	343	131	11
Ekurhuleni	Independent	Lakeview	71	34	7
Ekurhuleni	Life	Glynwood	292	112	10
Ekurhuleni	Netcare	Linmed	172	51	6
Ekurhuleni	Life	Roseacres Clinic	124	31	4
Ekurhuleni	Life	Springs Parkland Clinic	205	81	5
Ekurhuleni	Life	St Mary's Women's Clinic	37	6	2
Ekurhuleni	Independent	Sunshine	200	61	5

Table 64 continued: Gauteng private hospitals with total hospital beds, surgical beds and operating theatres.

Region	Owner	Hospital	Usable beds	Surgical beds	Theatres
Ekurhuleni	Independent	Mercidoc Day Clinic	20	20	2
Ekurhuleni	Netcare	Sunward Park	214	87	7
Ekurhuleni	Netcare	Union	222	138	7
Johannesburg	Lenmed	Daxima Medical Clinic	64	20	2
Johannesburg	Life	Brenthurst Clinic	233	60	8
Johannesburg	Life	Carstenhof Clinic	153	56	6
Johannesburg	Independent	Cure Day clinic Midstream	20	20	2
Johannesburg	Clinix	Clinix Private Soweto	146	28	3
Johannesburg	Clinix	Selby Park	642	55	5
Johannesburg	Life	Fourways	194	59	10
Johannesburg	Life	Flora Clinic	316	112	10
Johannesburg	Independent	Fordsburg Clinic	30	30	4
Johannesburg	Netcare	Garden City Clinic	363	104	12
Johannesburg	Lenmed	Lenmed Clinic	192	72	5
Johannesburg	Clinix	Clinix Lesedi Private	175	26	4
Johannesburg	Life	Sandton Surgical Centre	20	20	3
Johannesburg	Netcare	Linksfield Park	283	107	10
Johannesburg	Independent	Mayo	20	20	2
Johannesburg	Netcare	Milpark	346	155	13

Table 64 continued: Gauteng private hospitals with total hospital beds, surgical beds and operating theatres.

Region	Owner	Hospital	Usable beds	Surgical beds	Theatres
Johannesburg	Mediclinic	Morningside Mediclinic	230	62	8
Johannesburg	Netcare	Netcare Olivedale	265	166	10
Johannesburg	Netcare	Netcare Mulbarton	216	70	5
Johannesburg	Netcare	Netcare Park Lane Clinic	204	40	11
Johannesburg	Netcare	Netcare Rand Clinic	144	50	5
Johannesburg	Netcare	Netcare Rosebank Clinic	128	55	6
Johannesburg	Mediclinic	Sandton Mediclinic	379	114	10
Johannesburg	Netcare	Netcare Sunninghill	265	90	6
Johannesburg	Netcare	Netcare Waterfall City	126	36	1
Johannesburg	Independent	Wits Donald Gordon /Kenridge	190	85	9
Johannesburg	Clinix	Tshepo Themba Clinix	120	28	3
Johannesburg	Life	Life Wilgeheuwel	220	93	7
Johannesburg	Lenmed	Zamokuhle Private	36	8	2
Sedibeng	Independent	Cormed clinic	32	8	2
Sedibeng	Netcare	Netcare Vaalpark	68	20	3
Sedibeng	Clinix	Clinix Naledi - Nkanyezi Private	160	50	3
Sedibeng	Mediclinic	Emfuleni Mediclinic (Vanderbijlpark)	155	31	4
Sedibeng	Independent	Midvaal Private	94	53	5
Sedibeng	Life	Life Suikerbosrand Clinic	80	24	2

Table 64 continued: Gauteng private hospitals with total hospital beds, surgical beds and operating theatres.

Region	Owner	Hospital	Usable beds	Surgical beds	Theatres
Sedibeng	Mediclinic	Vereeniging Mediclinic	267	66	7
Tshwane	Netcare	Netcare Akasia Clinic	162	52	5
Tshwane	Netcare	Netcare Bougainville Private	60	36	3
Tshwane	Mediclinic	Mediclinic Hospital/Thabazimbi	21	5	1
Tshwane	Life	Life Eugene Marais	364	129	13
Tshwane	Life	Life Faerie Glen	87	52	5
Tshwane	Life	Life Brooklyn	27	27	4
Tshwane	Netcare	Netcare Femina Clinic	134	25	5
Tshwane	Netcare	Netcare Jakaranda	130	30	6
Tshwane	Mediclinic	Mediclinic Kloof	205	56	10
Tshwane	Mediclinic	Mediclinic Medforum	204	52	14
Tshwane	Mediclinic	Mediclinic Heart	90	20	3
Tshwane	Mediclinic	Mediclinic Legae Private	147	38	4
Tshwane	Life	Life Little Company of Mary	214	85	8
Tshwane	Independent	Louis Pasteur Private	240	34	5
Tshwane	Netcare	Netcare Montana Private	170	60	6
Tshwane	Netcare	Moot General Netcare	92	30	3
Tshwane	Mediclinic	Mediclinic Muelmed	222	48	8
Tshwane	Life	Life Pretoria North Surgical Centre	12	12	2

Table 64 continued: Gauteng private hospitals with total hospital beds, surgical beds and operating theatres.

Region	Owner	Hospital	Usable beds	Surgical beds	Theatres
Tshwane	Netcare	Netcare Pretoria East	358	92	14
Tshwane	Netcare	Netcare Unitas	469	168	16
Tshwane	Life	Life Wilgers	360	127	15
Tshwane	Independent	Wisani Medical Centre	12	0	0
Tshwane	Independent	Zuid Afrikaans	139	92	9
West Rand	Independent	Leslie Williams Memorial	109	52	3
West Rand	Netcare	Netcare Constantia Day clinic	24	24	3
West Rand	Netcare	Netcare Protea Day Clinic	10	10	2
West Rand	Netcare	Netcare Bell Street Hospital	50	10	4
West Rand	Netcare	Netcare Krugersdorp	285	135	11
West Rand	Life	Life Robinson Private Hospital	109	40	4
West Rand	Independent	Sir Albert Medical Centre	174	65	5
West Rand	Mining	Anglogold Western Deep Levels	294	93	4
	Total	85	14 326	4 837	500

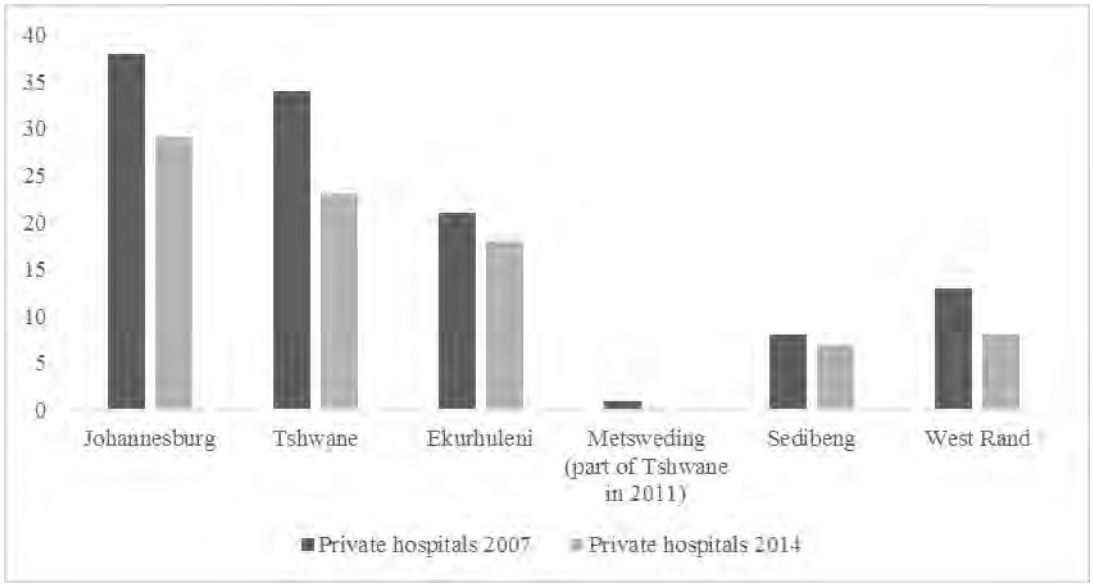


Figure 24: Comparative between Gauteng private hospital number for 2007 and 2014.

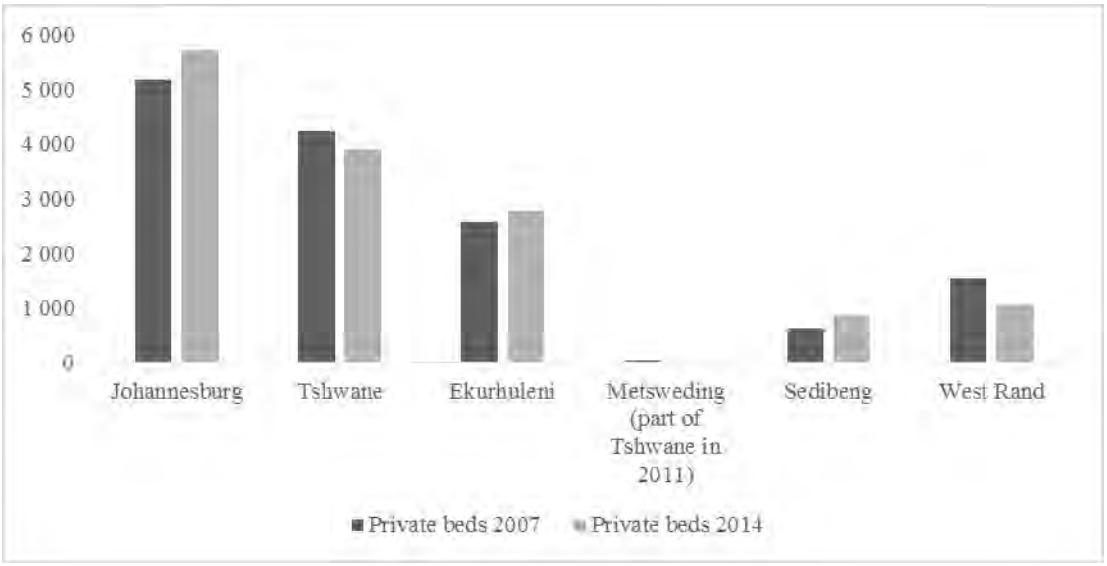


Figure 25: Comparative between Gauteng private hospital bed number for 2007 and 2014.

20.10 **Appendix J:** Chapter 8 Figures and Tables (KwaZulu-Natal Province)

Table 70: KwaZulu-Natal provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
Amajuba	District	Niemeyer Memorial	52	8	0	0	1
Amajuba	Regional	Madadeni	822	160	2	6	5
Amajuba	Regional	Newcastle	272	0	0	0	4
eThekwini	District	Osindisweni	240	42	0	1	1
eThekwini	District	St Mary's Hospital (Mariannhill)	200	30	0	13	1
eThekwini	District	Wentworth	266	32	0	0	1
eThekwini	National Central	Inkosi Albert Luthuli Central	852	194	12	2	19
eThekwini	Regional	Addington	571	100	7	5	7
eThekwini	Regional	King Edward VIII	833	194	10	5	11
eThekwini	Regional	Mahatma Gandhi	388	70	0	0	2

Table 70 continued: KwaZulu-Natal provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
eThekwini	Regional	Prince Mshiyeni Memorial	1 160	220	6	9	11
eThekwini	Regional	RK Khan	543	101	6	13	5
eThekwini	Regional	St Aidans	157	75	0	0	3
eThekwini	Regional Hospital	King Dinuzulu	661	98	0	0	4
iLembe	District	Montebello	111	7	0	4	1
iLembe	District	Umphumulo	141	16	0	0	1
iLembe	District	Untunjambili	130	12	0	0	1
iLembe	Regional	Stanger	500	134	2	7	4
Harry Gwala	District	Christ the King	197	36	0	6	3
Harry Gwala	District	East Griqualand/ Usher Memorial	185	32	0	1	2
Harry Gwala	District	Rietvlei	188	68	0	0	2
Harry Gwala	District	St Apollinaris	146	18	0	0	2
Ugu	District	GJ Crooke's	297	66	0	4	2
Ugu	District	Murchison	300	54	0	5	2
Ugu	District	St Andrew's	210	20	0	2	2
Ugu	Regional	Port Shepstone	336	53	2	8	4
uMgungundlovu	District	Appelsbosch	140	23	0	2	1

Table 70 continued: KwaZulu-Natal provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
uMgungundlovu	District	Northdale	431	76	0	10	5
uMgungundlovu	Provincial Tertiary	Grey's	507	160	10	13	13
uMgungundlovu	Regional	Edendale	879	160	7	12	12
uMkhanyakude	District	Bethesda	222	31	0	5	2
uMkhanyakude	District	Hlabisa	275	38	0	5	2
uMkhanyakude	District	Manguzi	264	25	0	3	2
uMkhanyakude	District	Mosvold	226	43	0	13	2
uMkhanyakude	District	Mseleni	219	17	0	5	2
uMzinyathi	District	Charles Johnson Memorial	190	30	0	3	2
uMzinyathi	District	Church of Scotland	347	50	0	15	2
uMzinyathi	District	Dundee	224	42	0	8	2
uMzinyathi	District	Greytown	271	43	0	6	2
uThukela	District	Emmaus	156	19	0	10	2
uThukela	District	Estcourt	325	75	0	2	3
uThukela	Regional	Ladysmith	448	76	1	2	4
uThungulu	District	Catherine Booth	167	20	0	0	1
uThungulu	District	Ekhombe	120	4	0	0	1
uThungulu	District	Eshowe	408	95	0	8	3

Table 70 continued: KwaZulu-Natal provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
uThungulu	District	KwaMagwaza	147	14	0	5	1
uThungulu	District	Mbongolwane	162	19	0	2	1
uThungulu	District	Nkandla	175	17	0	0	1
uThungulu	Regional	Lower Umfolozi War Memorial	270	36	0	0	3
uThungulu	Regional	Ngwelezana	489	45	3	6	6
Zululand	District	Benedictine	385	47	0	2	2
Zululand	District	Ceza	160	15	0	4	1
Zululand	District	Itshelejuba	154	0	0	11	2
Zululand	District	Nkonjeni	230	35	0	6	2
Zululand	District	Vryheid	338	97	0	0	0
	Total	55	18 087	3 192	68	249	183

Table 72: KwaZulu-Natal public hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	District 2007	District 2014	Regional 2007	Regional 2014	Central 2007	Central 2014	Public beds 2007	Public beds 2014
Amajuba	1	1	2	2	0	0	1 426	1 146
eThekwini	2	3	5	7	2	1	9 039	5 871
iLembe	3	3	1	1	0	0	817	882
Harry Gwala	4	4	0	0	0	0	795	716
Ugu	3	3	1	1	0	0	1 361	1 143
uMgungundlovu	2	2	1	1	1	1	4 875	1 975
uMkhanyakude	5	5	0	0	0	0	1 132	1 206
uMzinyathi	4	4	0	0	0	0	1 171	1 032
uThukela	2	2	1	1	0	0	1 037	929
uThungulu	5	6	3	2	0	0	2 122	1 938
Zululand	5	5	0	0	0	0	1 849	1 267
Total	36	38	14	15	3	2	25 624	18 105

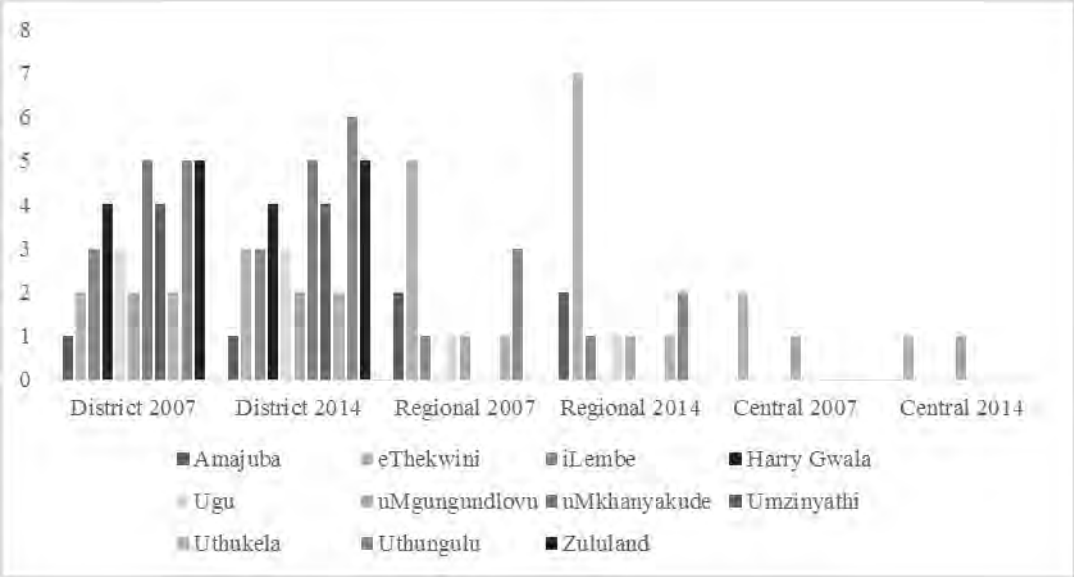


Figure 26: Comparative between KwaZulu-Natal public hospital number for 2007 and 2014.

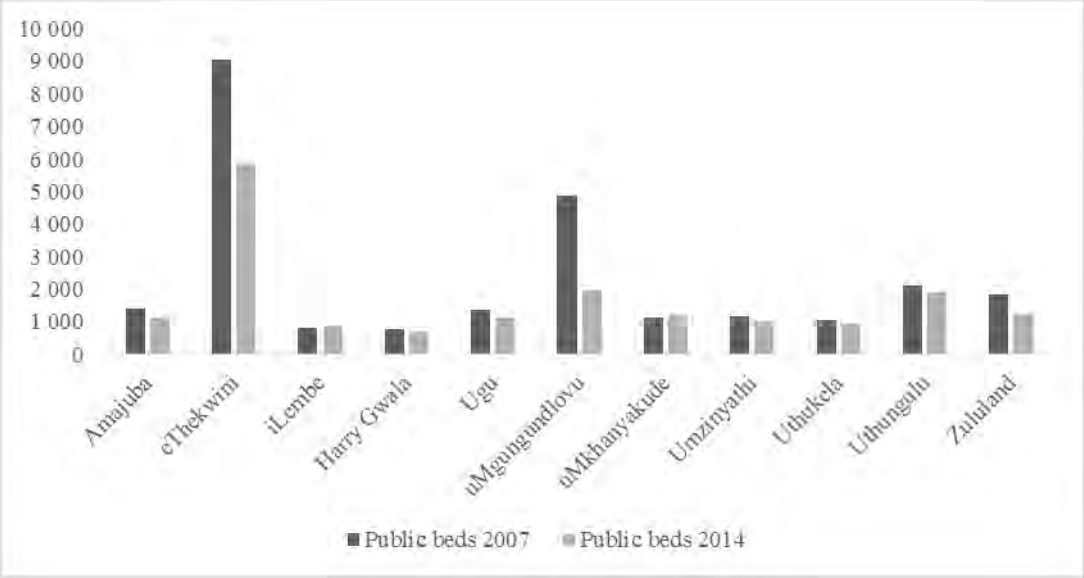


Figure 27: Comparative between KwaZulu-Natal public hospital beds for 2007 and 2014.

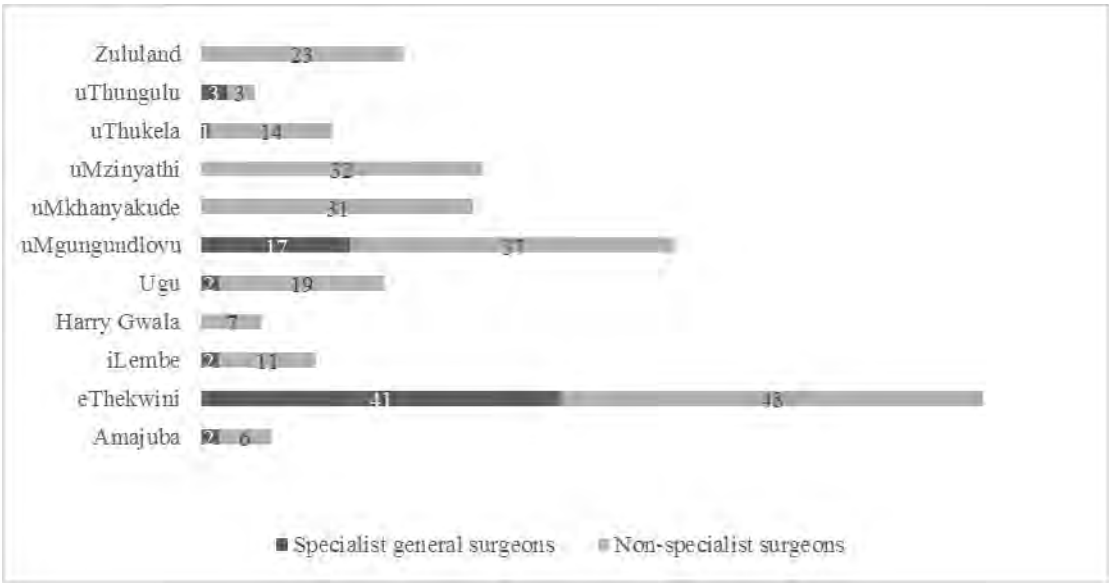


Figure 28: KwaZulu-Natal public specialist and non-specialist general surgeons by district.

Table 75: KwaZulu-Natal private hospitals with total hospital beds, surgical beds and operating theatres.

Region	Owner	Hospital	Usable Beds	Surgical beds	Theatres
Amajuba	Mediclinic	Newcastle Mediclinic	138	36	5
eThekwini	Life	Life Chatsmed Garden	177	54	7
eThekwini	Independent	Ascot Park Medical Centre	74	20	2
eThekwini	Independent	City Hospital	158	40	7
eThekwini	Life	Life Crompton	163	30	4
eThekwini	Independent	Daymed Private	52	20	2
eThekwini	Independent	Durdoc	50	12	4
eThekwini	Life	Life Entabeni	286	126	13
eThekwini	Independent	eThekwini Hospital and Heart Centre	246	71	7
eThekwini	Independent	Isipingo	168	20	4
eThekwini	Netcare	Netcare Kingsway	180	52	6
eThekwini	Life	Life Mount Edgecombe	173	52	4
eThekwini	Life	Life Nu-Shifa	133	46	3
eThekwini	Netcare	Netcare Parklands	212	43	8
eThekwini	Netcare	Netcare St Augustine's	418	185	15
eThekwini	Netcare	Netcare Umhlanga	224	82	8
eThekwini	Mediclinic	Victoria Mediclinic	120	25	4

Table 75 continued: KwaZulu-Natal private hospitals with total hospital beds, surgical beds and operating theatres.

Region	Owner	Hospital	Usable Beds	Surgical beds	Theatres
eThekwini	Life	Life Westville	270	85	11
iLembe	Netcare	Netcare Alberlito	119	25	3
Harry Gwala	Netcare	Netcare Kokstad	36	15	2
Harry Gwala	Independent	Hibiscus	103	22	2
Ugu	Netcare	Netcare Margate	99	22	4
Ugu	Independent	Midlands Medical Centre	225	61	5
Ugu	Independent	Shelly Beach Day	64	0	0
uMgungundlovu	Mediclinic	Pietermaritzburg Mediclinic	139	42	6
uMgungundlovu	Mediclinic	Mediclinic Howick	26	20	2
uMgungundlovu	Netcare	Netcare St Anne's	179	72	8
uMkhanyakude		Nil			
uMzinyathi		Nil			
uThukela	Lenmed	La Verna	105	34	3
uThungulu	Life	Life Empangeni Garden Clinic	174	56	5
uThungulu	Netcare	Netcare The Bay	263	78	7
Zululand	Independent	Pongola	28	3	1
	Total	32	4 802	1 459	162

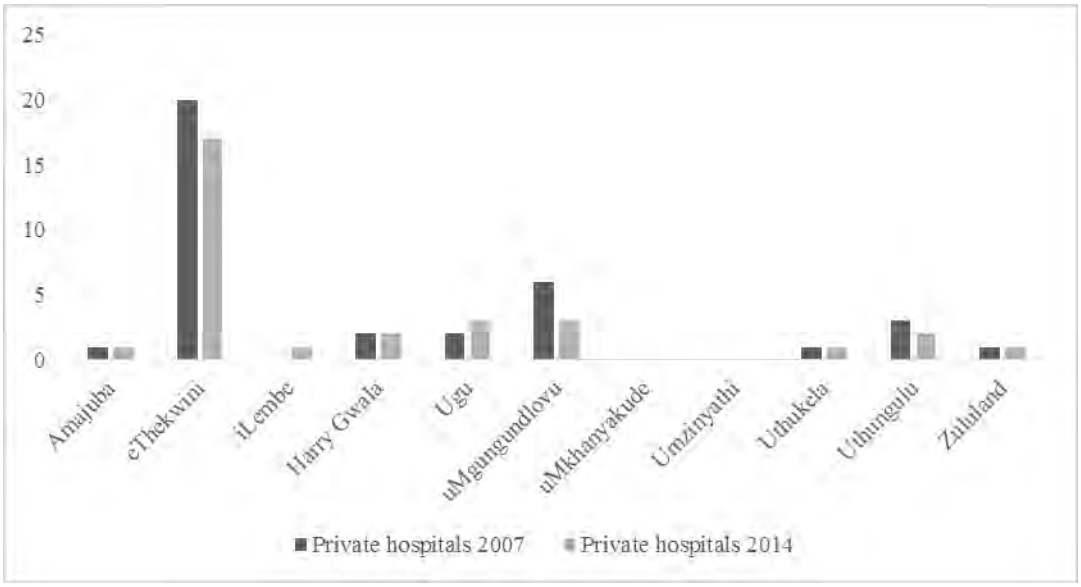


Figure 29: Comparative between KwaZulu-Natal private hospital number for 2007 and 2014.

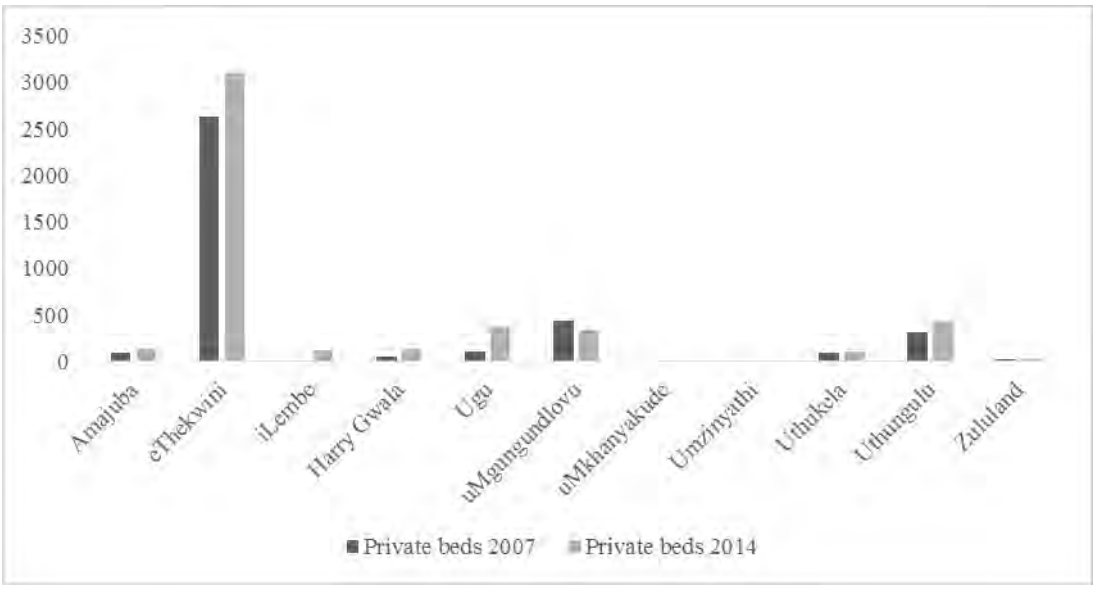


Figure 30: Comparative between KwaZulu-Natal private hospital bed number for 2007 and 2014.

20.11 **Appendix K:** Chapter 9 Figures and Tables (Limpopo Province)

Table 81: Limpopo provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist	Theatres
Capricorn	District	Botlokwa	88	12	0	6	2
Capricorn	District	Helene Franz	63	0	0	7	2
Capricorn	District	Lebowakgomo	220	72	0	3	2
Capricorn	District	Seshego	164	60	0	5	2
Capricorn	District	WF Knobel	243	0	0	0	1
Capricorn	District	Zebediela	74	10	0	0	0
Capricorn	Tertiary	Mankweng complex	509	30	0	10	4
Capricorn	Tertiary	Polokwane complex	490	100	3	20	6
Sekhukhune	District	Dilokong	186	46	0	0	2
Sekhukhune	District	Groblersdal Hospital/HA Grove	10	10	0	4	0
Sekhukhune	District	Jane Furse	200	36	0	16	1
Sekhukhune	District	Matlala	60	26	0	7	1
Sekhukhune	District Hospital	Mecklenburg	124	12	0	7	2
Sekhukhune	Regional	Philadelphia	278	28	0	2	2
Sekhukhune	Regional	St Rita's	331	44	0	0	0
Mopani	District	Dr CN Phatudi	62	20	0	1	1
Mopani	District	Kgapane	262	70	1	2	3

Table 81 continued: Limpopo provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist	Theatres
Mopani	District	Maphutha L Malatjie	104	0	0	0	1
Mopani	District	Nkhensani	250	36	0	6	3
Mopani	District	Sekororo	208	0	0	6	2
Mopani	District	Van Velden Memorial (Tzaneen)	67	25	0	2	1
Mopani	Regional	Letaba	276	37	2	2	0
Vhembe	District	Donald Fraser	300	28	0	13	2
Vhembe	District	Elim	375	40	0	5	4
Vhembe	District Hospital	Louis Trichardt / Mhkado	52	12	0	2	1
Vhembe	District Hospital	Malamulele	195	40	0	7	1
Vhembe	District	Messina	80	20	0	6	1
Vhembe	District	Siloam	350	35	0	10	2
Vhembe	Regional	Tshilidzini	434	60	0	6	0
Waterberg	District	Ellisras	120	20	0	4	1
Waterberg	District	FH Odendaal (Nylstroom)	100	8	0	0	2
Waterberg	District	George Masebe	260	15	0	6	1
Waterberg	District	Thabazimbi	110	30	0	12	2

Table 81 continued: Limpopo provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist	Theatres
Waterberg	District	Voortrekker Memorial (Potgietersrus)	142	12	0	20	2
Waterberg	District	Warmbaths	135	16	0	0	3
Waterberg	District	Witpoort	59	4	0	4	1
Waterberg	Regional	Mokopane	260	66	0	4	2
	Total	37	7 241	1 080	6	205	63

Table 83: Limpopo public hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	District 2007	District 2014	Regional 2007	Regional 2014	Central 2007	Central 2014	Public beds 2007	Public beds 2014
Bohlabela (eliminated)	3	0	1	0	0	0	872	0
Capricorn	8	6	0	0	2	2	2 605	1 851
Sekhukhune	6	5	1	2	0	0	1 386	1 189
Mopani	7	6	1	1	0	0	1 450	1 229
Vhembe	7	6	1	1	0	0	1 948	1 786
Waterberg	6	7	2	1	0	0	889	1 186
Total	37	30	6	5	2	2	9 150	7 241

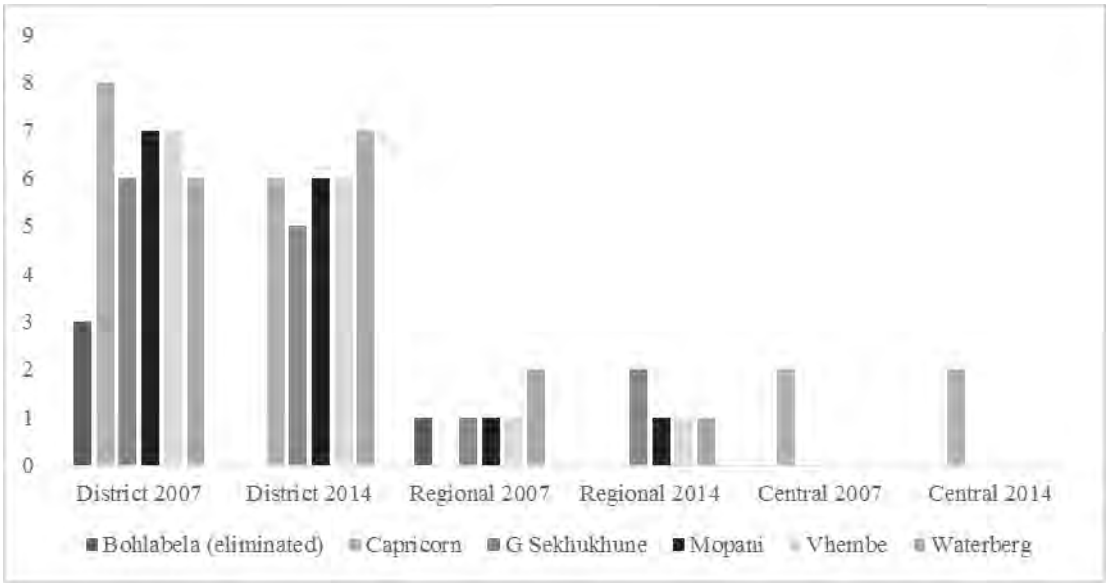


Figure 31: Comparative between Limpopo public hospital number for 2007 and 2014.

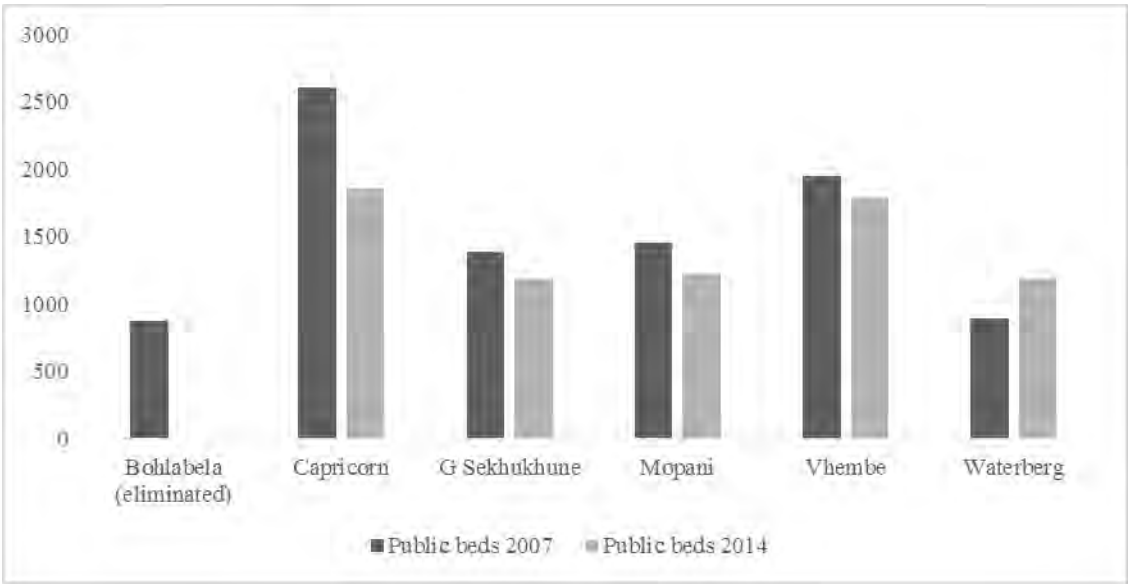


Figure 32: Comparative between Limpopo public hospital beds for 2007 and 2014.

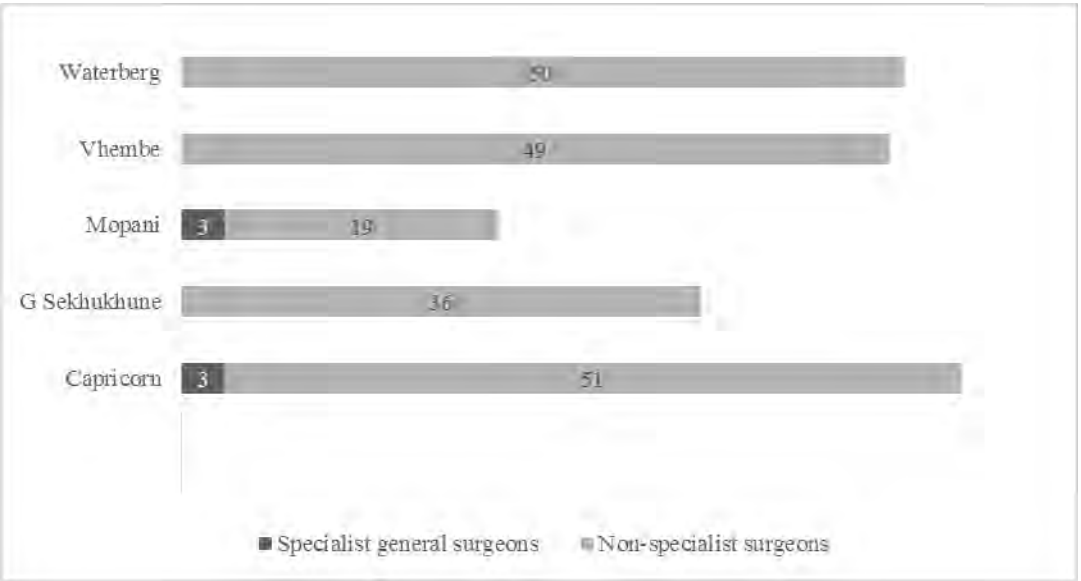


Figure 33: Limpopo public specialist and non-specialist general surgeons by district.

Table 86: Limpopo province private hospitals with total hospital beds, surgical beds and operating theatres.

Region	Owner	Hospital	Usable beds	Surgical beds	Theatres
Capricorn	Mediclinic	Limpopo Mediclinic	247	105	8
Sekhukhune		nil			
Mopani	Mediclinic	Mediclinic Tzaneen Private	129	35	3
Vhembe	Independent	Zoutpansberg Private	22	6	1
Waterberg	Life	Life St Vincent's	83	24	2
Waterberg	Mediclinic	Mediclinic Marapong	12	6	1
Waterberg	Mediclinic	Mediclinic Thabazimbi	21	4	1
Waterberg	Clinix	Clinix Phalaborwa	62	17	2
	Total	7	576	197	18

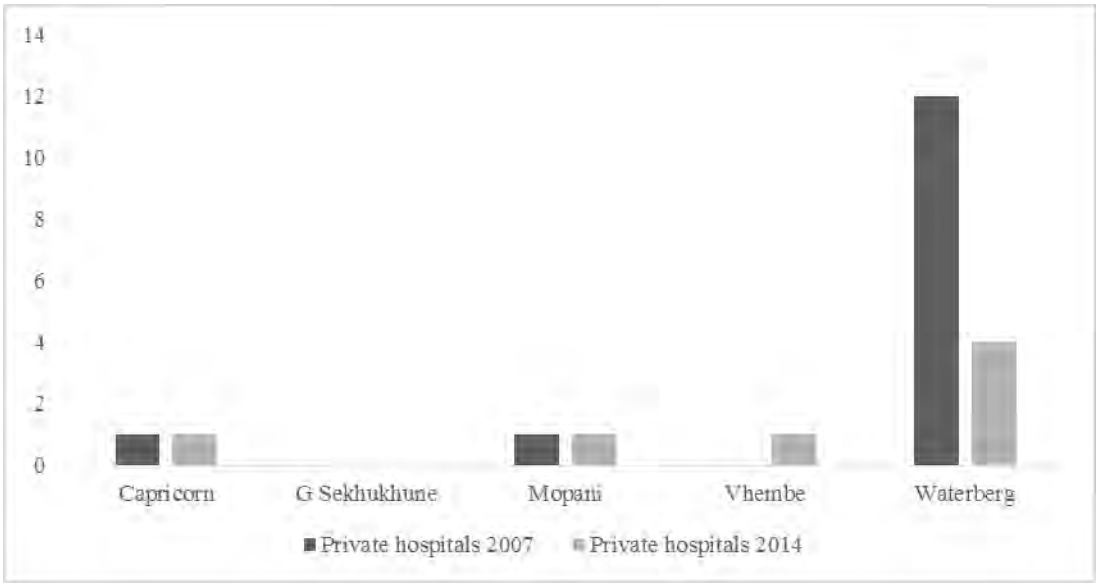


Figure 34: Comparative between Limpopo private hospital number for 2007 and 2014.

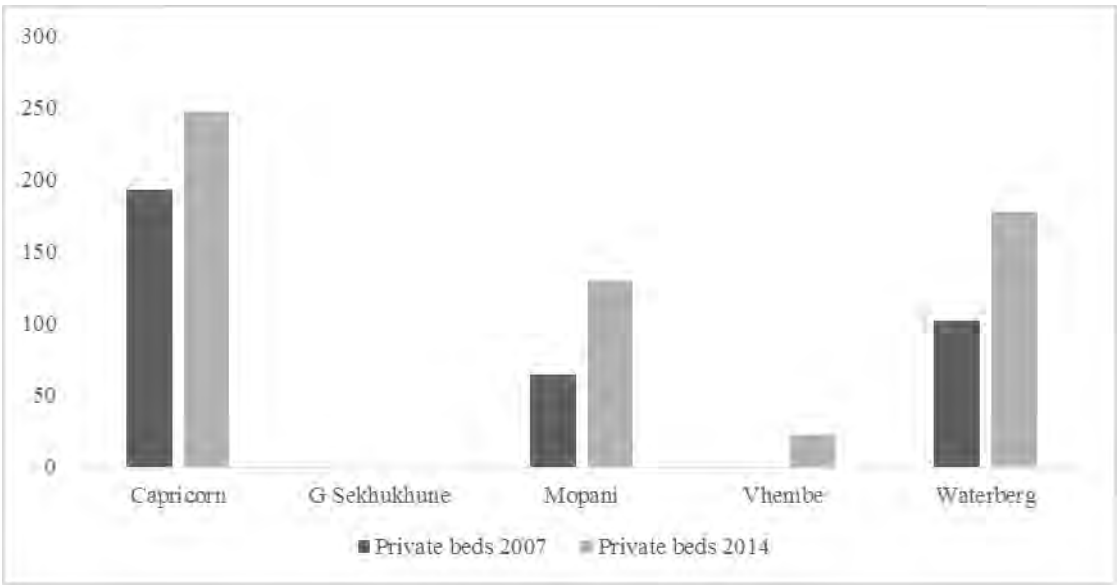


Figure 35: Comparative between Limpopo private hospital bed number for 2007 and 2014.

20.12 **Appendix L:** Chapter 10 Figures and Tables (Mpumalanga Province)

Table 92: Mpumalanga provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
Ehlanzeni	District	Barberton	151	46	0	5	3
Ehlanzeni	District	Lydenburg	119	30	0	1	2
Ehlanzeni	District	Matibidi	100	0	0	0	1
Ehlanzeni	District	Matikwana	300	30	0	0	2
Ehlanzeni	District	Sabie	99	20	0	1	2
Ehlanzeni	District	Shongwe	220	36	0	2	1
Ehlanzeni	District	Tintswalo	240	30	0	2	2
Ehlanzeni	District	Tonga	160	50	0	5	2
Ehlanzeni	Tertiary	Rob Ferreira	301	50	3	5	4
Ehlanzeni	Regional	Mapulaneng	269	28	0	0	3
Ehlanzeni	Regional	Themba	426	40	1	6	3
G Sibande	District	Amajuba Memorial	95	12	0	7	2
G Sibande	District	Bethal	178	41	0	0	1
G Sibande	District	Carolina	80	20	0	6	2
G Sibande	District	Elsie Ballot	22	0	0	0	0
G Sibande	District	Embhuleni	189	60	0	2	3
G Sibande	District	Evander	113	32	0	0	2

Table 92 continued: Mpumalanga provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
G Sibande	District	Piet Retief	176	30	0	6	3
G Sibande	District	Standerton	219	24	0	8	3
G Sibande	Regional	Ermelo	220	64	0	6	3
Nkangala	District	Bernice Samuels	160	60	0	6	1
Nkangala	District	HA Grove	19	0	0	0	1
Nkangala	District	Impungwe (Wolwekrans)	50	0	0	0	0
Nkangala	District	KwaMhlanga	150	16	0	4	1
Nkangala	District	Middelburg	247	64	0	4	5
Nkangala	District	Mmametlhake	60	4	0	8	2
Nkangala	District	Waterval Boven	80	0	0	0	1
Nkangala	Tertiary	Witbank	349	57	1	5	5
	Total	28	4 792	844	5	89	60

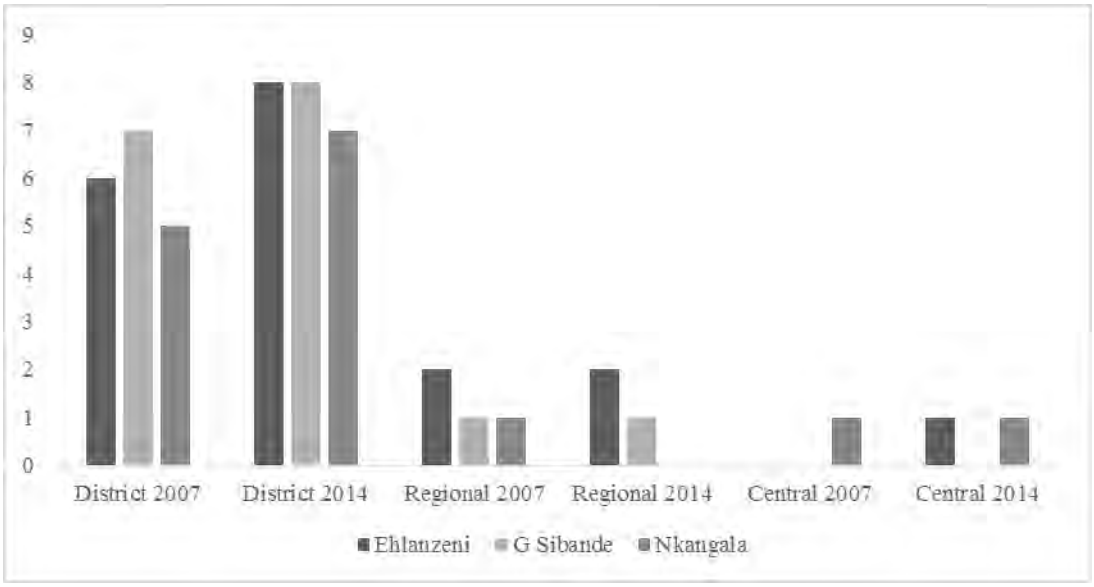


Figure 36: Comparative between Mpumalanga public hospital number for 2007 and 2014.

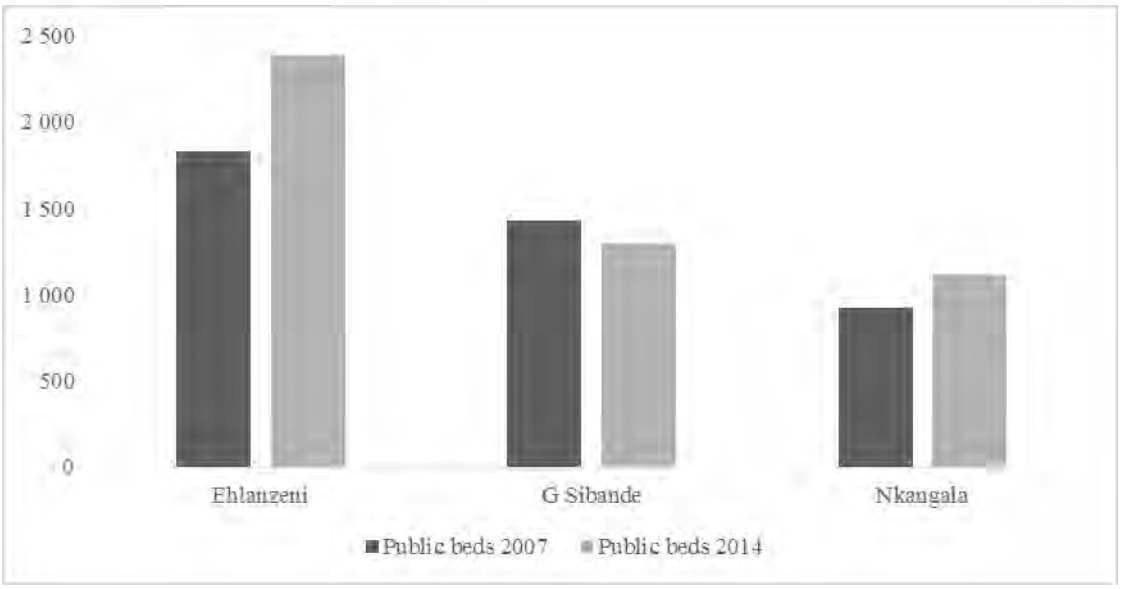


Figure 37: Comparative between Mpumalanga public hospital beds for 2007 and 2014.

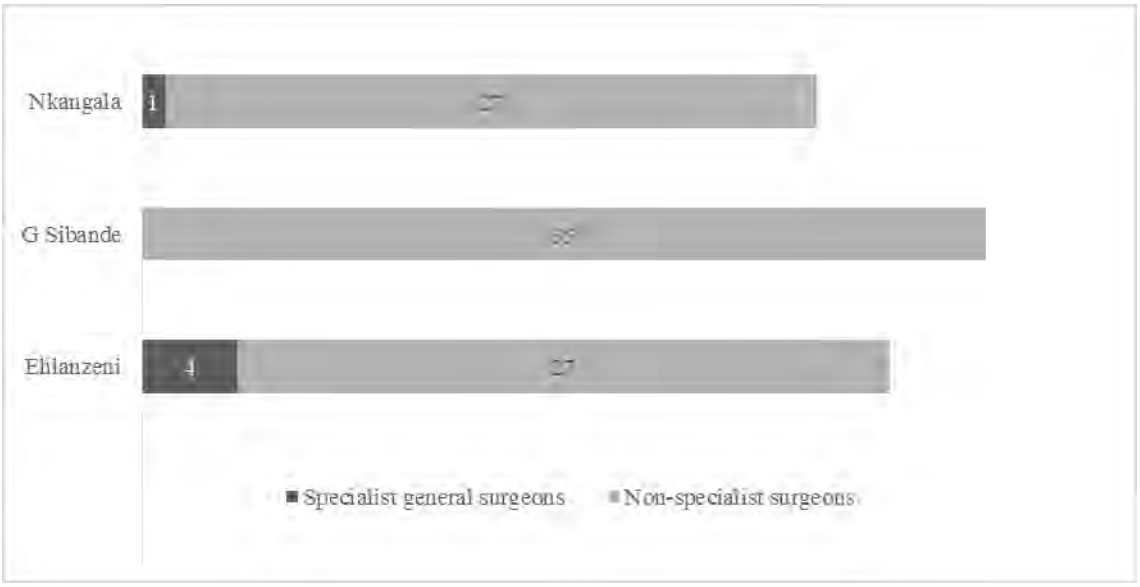


Figure 38: Mpumalanga public specialist and non-specialist general surgeons by district.

Table 97: Mpumalanga private hospitals with total hospital beds, surgical beds and operating theatres.

Region	Owner	Hospital	Usable beds	Surgical beds	Theatres
Ehlanzeni	Mediclinic	Mediclinic Barbeton	30	5	1
Ehlanzeni	Mediclinic	Nelspruit Mediclinic	314	89	9
G Sibande	Mediclinic	Ermelo Mediclinic	40	11	2
G Sibande	Mining	Evander Gold Mining	104	40	1
G Sibande	Life	Life Piet Retief	45	17	2
G Sibande	Mediclinic	Mediclinic Secunda	43	24	3
G Sibande	Mediclinic	Trichardt Mediclinic	202	64	4
Nkangala	Mining	Amcoal Highveld	134	34	2
Nkangala	Life	Life Cosmos	205	60	7
Nkangala	Independent	Kriel medical	6	6	1
Nkangala	Life	Life Midmed	159	34	4
Nkangala	Independent	Emalahleni private	100	22	3
	Total	12	1 382	406	39

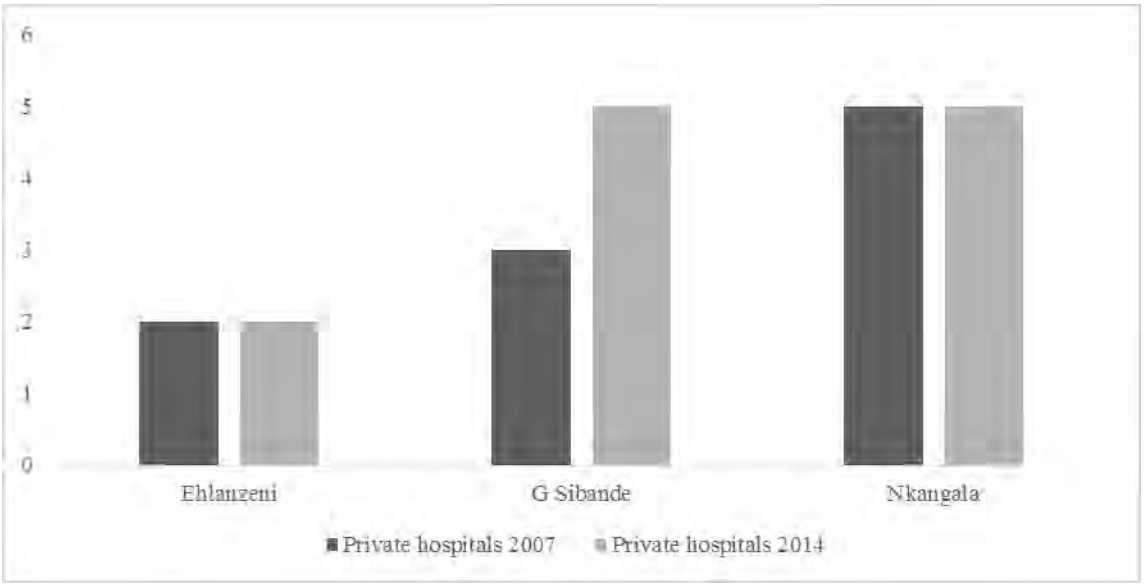


Figure 39: Comparative between Mpumalanga private hospital number for 2007 and 2014.

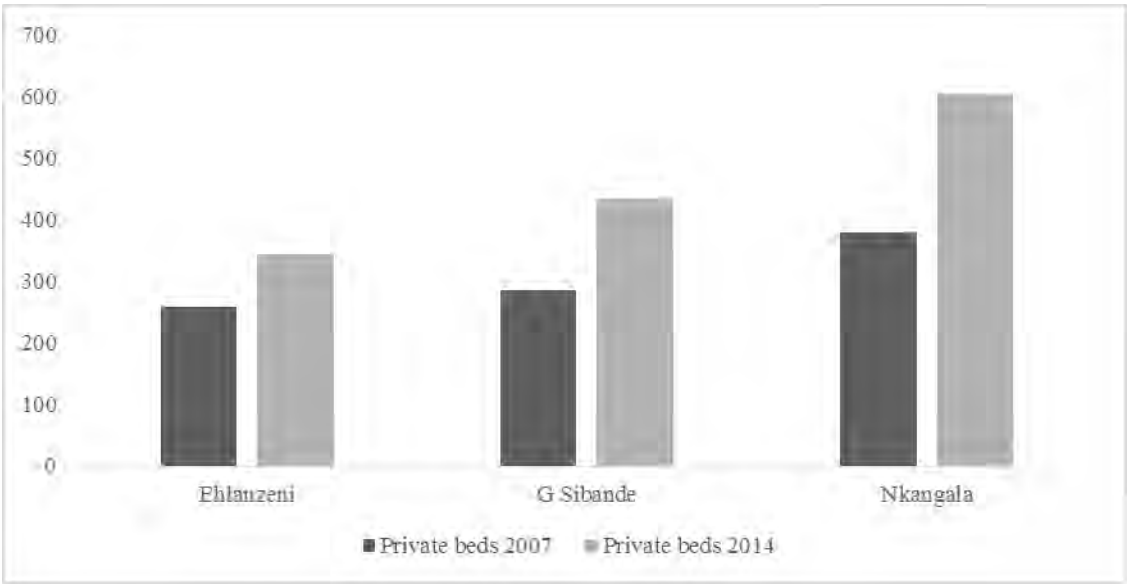


Figure 40: Comparative between Mpumalanga private hospital bed number for 2007 and 2014.

Table 99: Mpumalanga private hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	Private hospitals 2007	Private hospitals 2014	Private beds 2007	Private beds 2014
Ehlanzeni	2	2	258	344
G Sibande	3	5	285	434
Nkangala	5	5	380	604
Total	10	12	923	1 382

20.13 **Appendix M:** Chapter 11 Figures and Tables (Northern Cape Province)

Table 103: Northern Cape provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
Frances Baard	District	Hartswater (Connie Vorster)	50	0	0	4	1
Frances Baard	District	Jan Kempdorp	16	0	0	0	0
Frances Baard	District	Prof ZK Matthews	45	12	0	8	1
Frances Baard	District	Warrenton	28	0	0	0	0
Frances Baard	Regional	Kimberley	694	146	4	7	5
J T Gaetsewe	District	Kuruman	69	10	0	7	1
J T Gaetsewe	District	Tshwaragano	214	40	0	5	1
Namakwa	District	Calvinia (Abraham Esau)	45	5	0	4	1
Namakwa	District	Springbok (Dr Van Niekerk)	57	6	0	5	2
Pixley ka Seme	District	De Aar (Central Karoo)	51	0	1	5	2
Pixley ka Seme	District	Douglas (Hester Malan)	35	0	0	0	0
Pixley ka Seme	District	Manne Dipico (Colesberg)	32	0	0	0	0

Table 103 continued: Northern Cape provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
Pixley ka Seme	District	Prieska (Bill Pickard)	30	2	0	2	1
ZF Mgcawu	District	Dr Harry Surtie	186	45	0	3	2
ZF Mgcawu	District	Kakamas	30	4	0	2	0
ZF Mgcawu	District	Keimoes	30	2	0	0	0
ZF Mgcawu	District	Postmasburg	42	20	0	0	0
	Total	17	1 654	292	5	52	17

Table 105: Northern Cape public hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	District 2007	District 2014	Regional 2007	Regional 2014	Central 2007	Central 2014	Public beds 2007	Public beds 2014
Frances Baard	4	4	1	1	0	0	731	833
JT Gaetsewe	2	2	0	0	0	0	278	283
Namakwa	6	2	0	0	0	0	150	102
Pixley ka Seme	8	4	1	0	0	0	234	148
ZF Mgcawu	4	4	0	0	0	0	315	288
Total	24	16	2	1	0	0	1 708	1 654

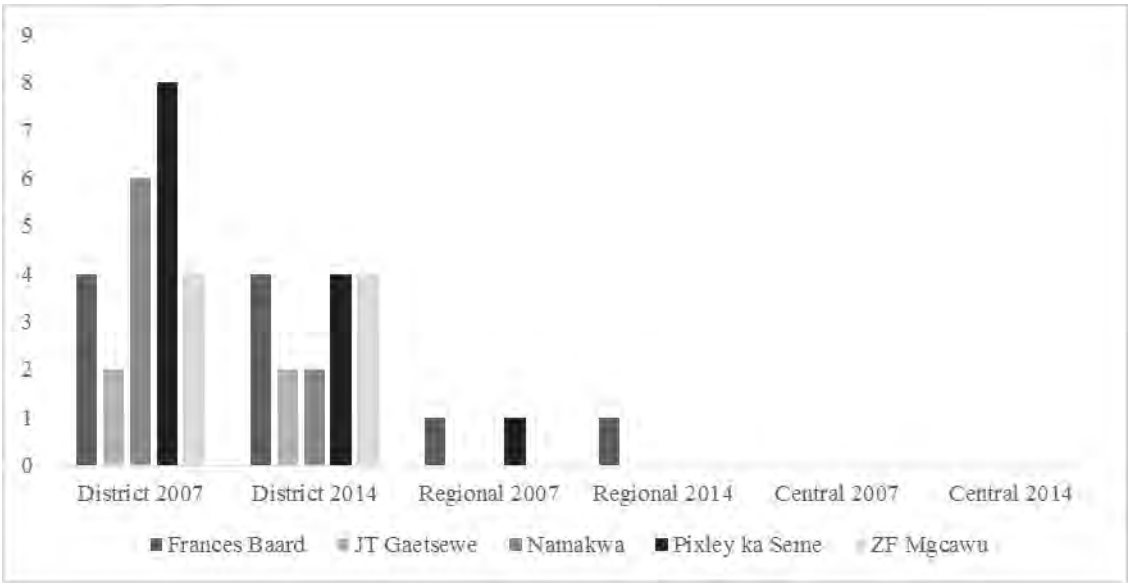


Figure 41: Comparative between Northern Cape public hospital number for 2007 and 2014.

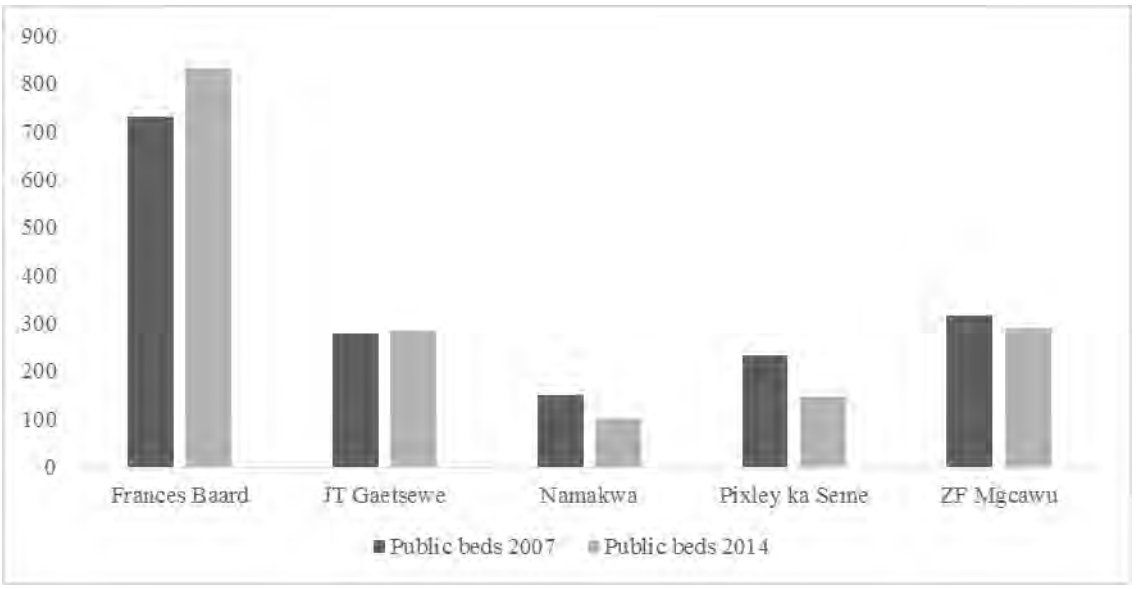


Figure 42: Comparative between Northern Cape public hospital beds for 2007 and 2014.

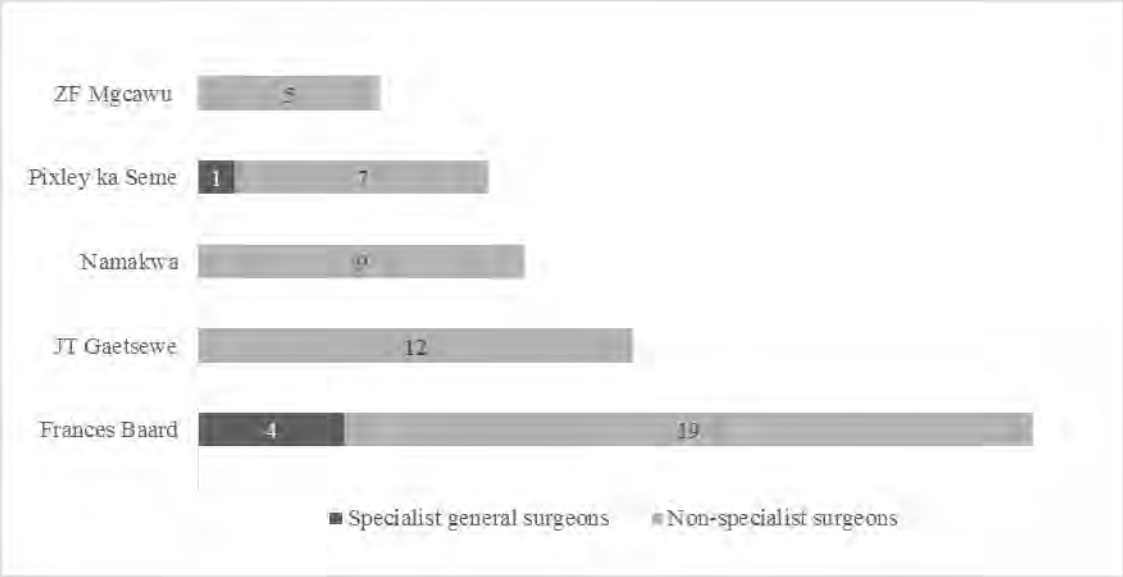


Figure 43: Northern Cape public specialist and non-specialist general surgeons by district.

Table 108: Northern Cape private hospitals with total hospital beds, surgical beds and operating theatres.

Region	Owner	Hospital	Usable beds	Surgical beds	Theatres
Frances Baard	Mediclinic	Mediclinic Kimberley	252	91	8
J T Gaetsewe	Mediclinic	Kathu Mediclinic	25	8	1
Namakwa	Independent	Kleinzee	34	10	1
Pixley ka Seme		nil			
ZF Mgcawu	Mediclinic	Upington Mediclinic	50	17	2
	Total	4	361	126	12

Table 110: Northern Cape private hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	Private hospitals 2007	Private hospitals 2014	Private beds 2007	Private beds 2014
Frances Baard	1	1	234	252
JT Gaetsewe	0	1	0	25
Namakwa	1	1	26	34
Pixley ka Seme	0	0	0	0
ZF Mgcawu	1	1	40	50
Total	3	4	300	361

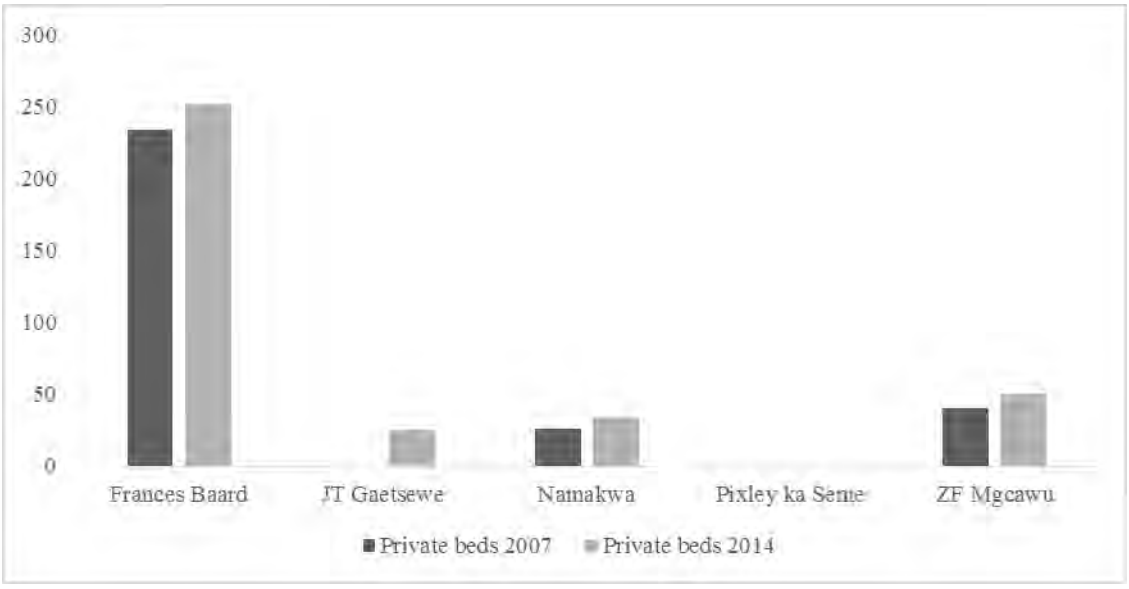


Figure 44: Comparative between Northern Cape private hospital bed number for 2007 and 2014.

20.14 **Appendix N:** Chapter 12 Figures and Tables (North West Province)

Table 114: North West provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons non-specialist	Theatres
Bojanala	District	Brits	100	20	3	8	1
Bojanala	District	Moses Kotane	196	44	0	10	2
Bojanala	District	Swartruggens/ Koster	35	0	0	2	1
Bojanala	Regional	Job Shimankana Tabane	390	35	1	12	5
Dr K Kaunda	District	Nic Bodenstein	88	20	0	6	1
Dr K Kaunda	District	Ventersdorp	40	10	0	0	1
Dr K Kaunda	Regional	Klerksdorp/ Tshepong	803	169	2	2	13
Dr K Kaunda	Regional	Potchefstroom	335	37	1	25	4
NM Molema	District	Gelukspan	184	36	0	0	2

Table 114 continued: North West provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons non-specialist	Theatres
NM Molema	District	Thusong/ General de la rey	120	40	0	7	2
NM Molema	District	Lehurutshe	97	0	0	6	1
NM Molema	District	Zeerust	76	0	0	4	0
NM Molema	Regional	Mafikeng	392	134	2	7	4
RS Mompati	District	Christiana	42	0	1	0	0
RS Mompati	District	Ganyesa	60	0	4	4	2
RS Mompati	District	Schweizer-Reneke	68	0	0	4	2
RS Mompati	District	Taung	290	50	0	6	2
RS Mompati	Regional	Joe Maralong memorial	96	32	0	4	3
	Total	18	3 412	627	14	107	46

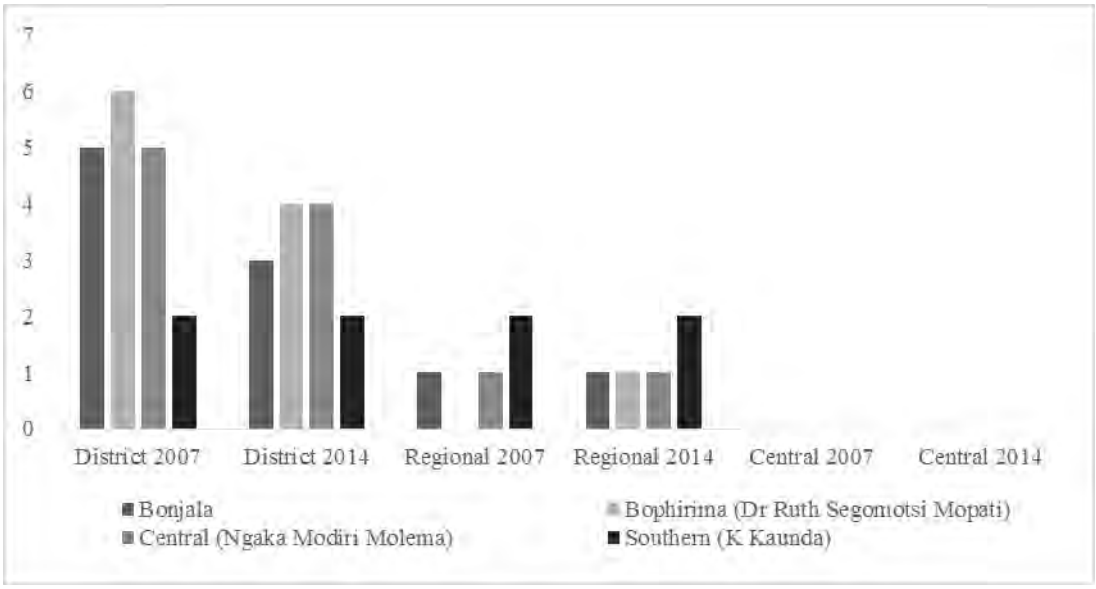


Figure 45: Comparative between North West public hospital number for 2007 and 2014.

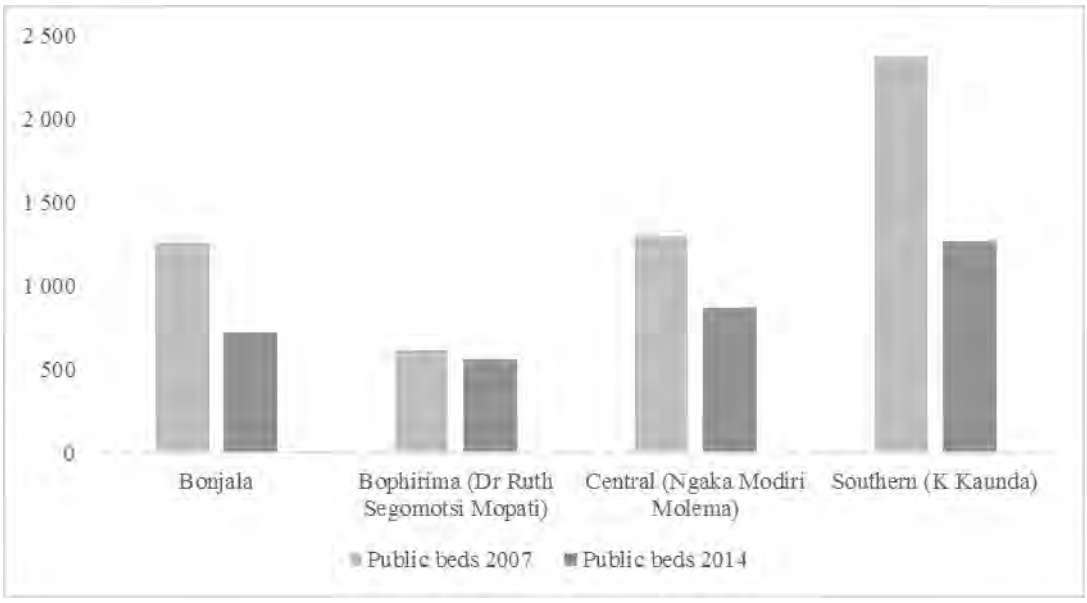


Figure 46: Comparative between North West public hospital beds for 2007 and 2014.

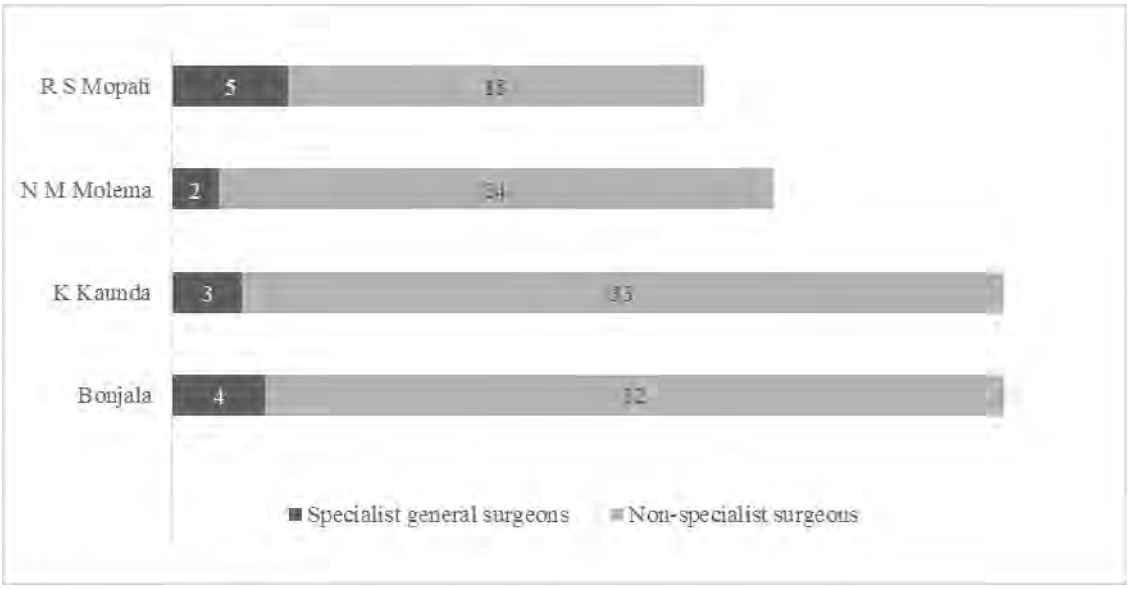


Figure 47: North West public specialist and non-specialist general surgeons by district.

Table 119: North West private hospitals with total hospital beds, surgical beds and operating theatres.

Region	Owner	Hospital	Usable beds	Surgical beds	Theatres
Bojanala Platinum	Mining	Andrew Saffey Mine	56	23	0
Bojanala Platinum	Mediclinic	Mediclinic Brits	80	21	3
Bojanala Platinum	Life	Life Le Femme	40	14	2
Bojanala Platinum	Netcare	Netcare Ferncrest	163	60	5
Bojanala Platinum	Life	Life Peglerae	159	103	6
Dr K Kaunda	Life	Life Anncron Clinic	150	56	6
Dr K Kaunda	Independent	Fochville	37	8	1
Dr K Kaunda	Mediclinic	Potchefstroom Mediclinic	127	41	4
Dr K Kaunda	Independent	Sunningdale	62	18	2
Dr K Kaunda	Independent	Mooimed	35	13	2
Dr K Kaunda	Mining	West Vaal	275	94	3
Dr K Kaunda	Independent	Wilmed Park Private	144	72	6
N M Molema	Clinix	Clinix Victoria	93	45	3
Dr R S Mompati	Independent	Vryburg Private	44	8	2
	Total	14	1 465	576	45

Table 121: North West private hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	Private hospitals 2007	Private hospitals 2014	Private beds 2007	Private beds 2014
Bonjala	4	5	422	498
Dr R S Mompati	1	1	40	44
N M Molema	1	1	93	93
K Kaunda	8	7	484	830
Total	14	14	1 039	1 465

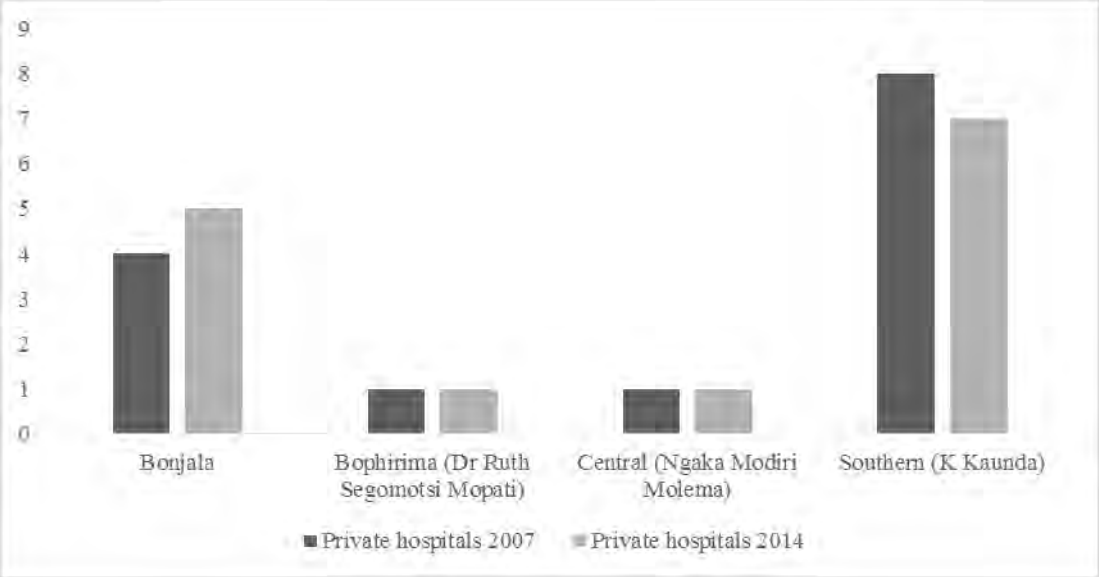


Figure 48: Comparative between North West private hospital number for 2007 and 2014.

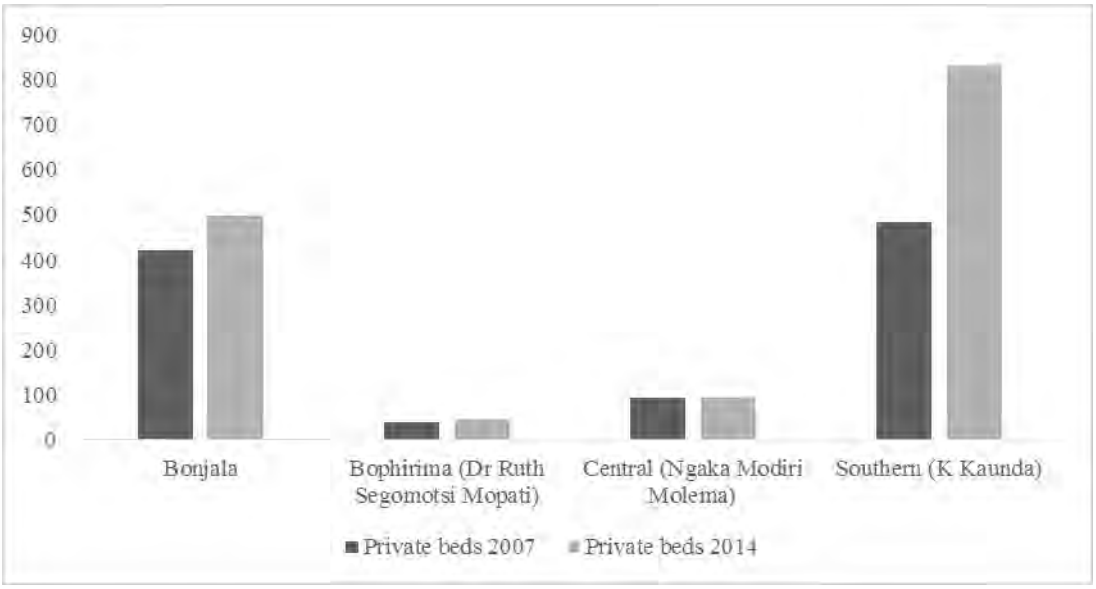


Figure 49: Comparative between North West private hospital bed number for 2007 and 2014.

20.15 **Appendix O:** Chapter 13 Figures and Tables (Western Cape Province)

Table 125: Western Cape provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
Cape Town	District	Eerste River	130	32	1	3	3
Cape Town	District	False Bay	65	7	0	1	2
Cape Town	District	Helderberg	169	34	0	2	1
Cape Town	District	Karl Bremer	217	37	2	6	2
Cape Town	District	Khayelitsha	240	45	0	5	2
Cape Town	District	Mitchells Plain	270	60	2	6	4
Cape Town	District	Victoria	193	52	1	3	3
Cape Town	District	Wesfleur	31	5	0	1	1
Cape Town	National Central	Groote Schuur	945	97	42	57	26
Cape Town	National Central	Red Cross Children's	270	60	0	2	11
Cape Town	National Central	Tygerberg	1 280	352	14	37	28
Cape Town	Regional	Somerset	334	40	3	4	4

Table 125 continued: Western Cape provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
Winelands	District	Ceres	86	0	0	1	1
Winelands	District	Montagu	40	10	0	3	1
Winelands	District	Robertson	46	12	0	4	1
Winelands	District	Stellenbosch	85	14	0	8	2
Winelands	Regional	Paarl	301	72	2	5	5
Winelands	Regional	Worcester	269	48	3	6	6
Central Karoo	District	Beaufort West	57	6	0	5	2
Central Karoo	District	Laingsburg	20	1	0	1	1
Central Karoo	District	Murraysburg	14	1	0	1	0
Central Karoo	District	Prince Albert	29	3	0	0	1
Eden	District	Knysna	90	10	1	9	2
Eden	District	Ladismith (Alan Blyth)	30	6	0	4	1
Eden	District	Mossel Bay	90	8	1	14	2
Eden	District	Oudtshoorn	123	20	0	14	3
Eden	District	Riversdale	50	8	1	6	1
Eden	District	Uniondale	13	2	0	0	1
Eden	Regional	George	268	50	3	5	6
Overberg	District	Caledon	50	4	0	6	1

Table 125 continued: Western Cape provincial hospitals, total hospital beds, surgical beds, general surgeon (Specialist and non-specialist) and operating theatre numbers.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Surgeons (SP)	Surgeons (non-specialist)	Theatres
Overberg	District	Hermanus	71	0	0	12	2
Overberg	District	Otto Du Plessis	30	6	0	2	1
Overberg	District	Swellendam	51	13	0	5	1
West Coast	District	Citrusdal	34	4	0	1	1
West Coast	District	Clanwilliam	50	9	0	2	1
West Coast	District	LAPA Munnik	10	1	0	1	1
West Coast	District	Radie Kotze	31	7	1	4	1
West Coast	District	Swartland	88	20	0	5	2
West Coast	District	Vredenburg	81	8	0	3	1
West Coast	District	Vredendal	75	10	0	2	1
	Total	40	6 326	1 174	77	256	136

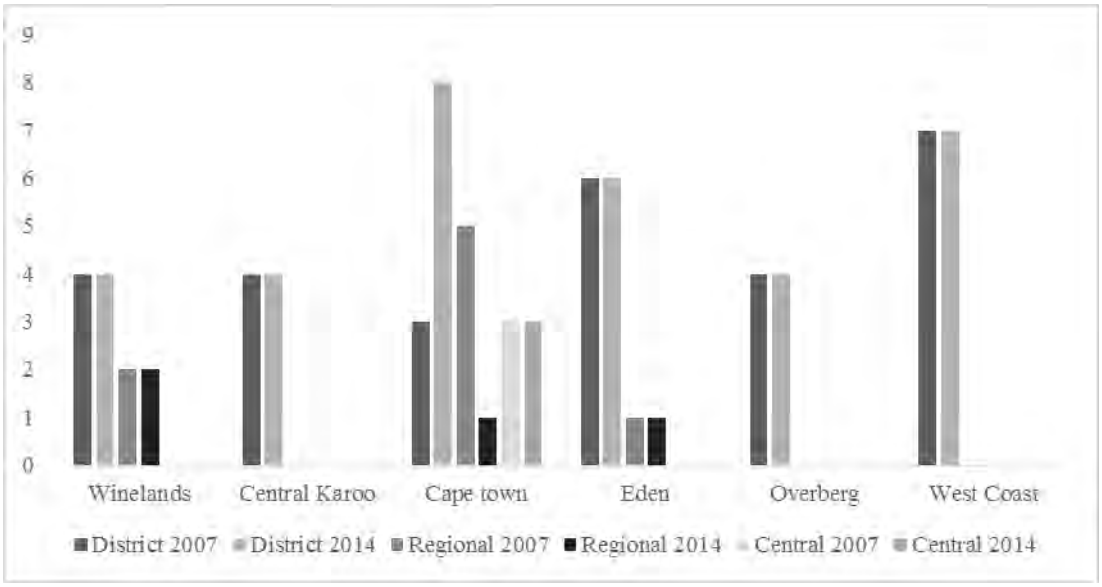


Figure 50: Comparative between Western Cape public hospital number for 2007 and 2014.

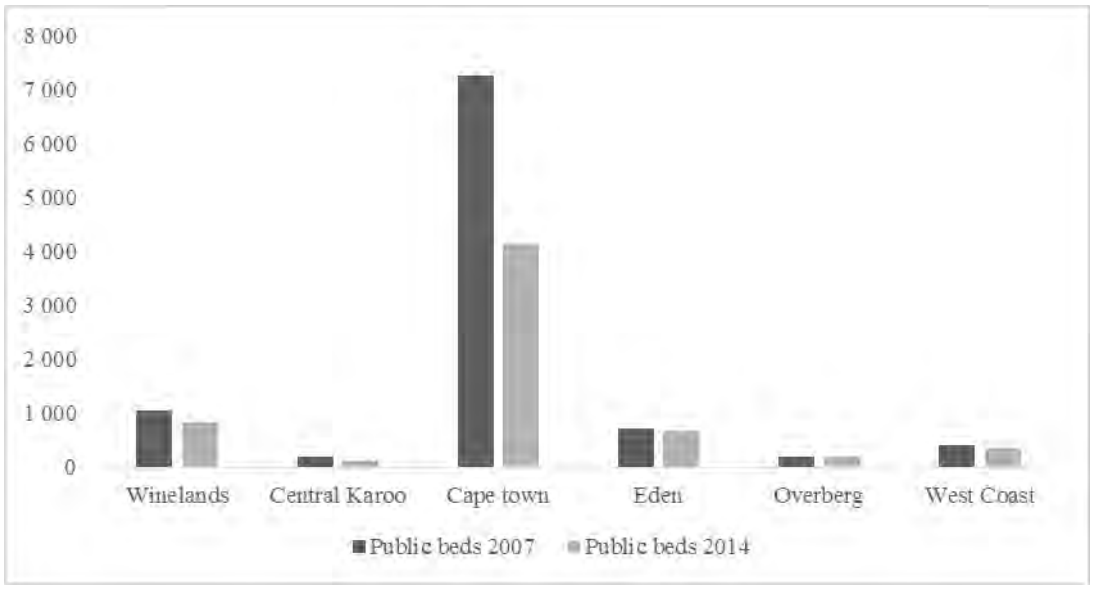


Figure 51: Comparative between Western Cape public hospital beds for 2007 and 2014.

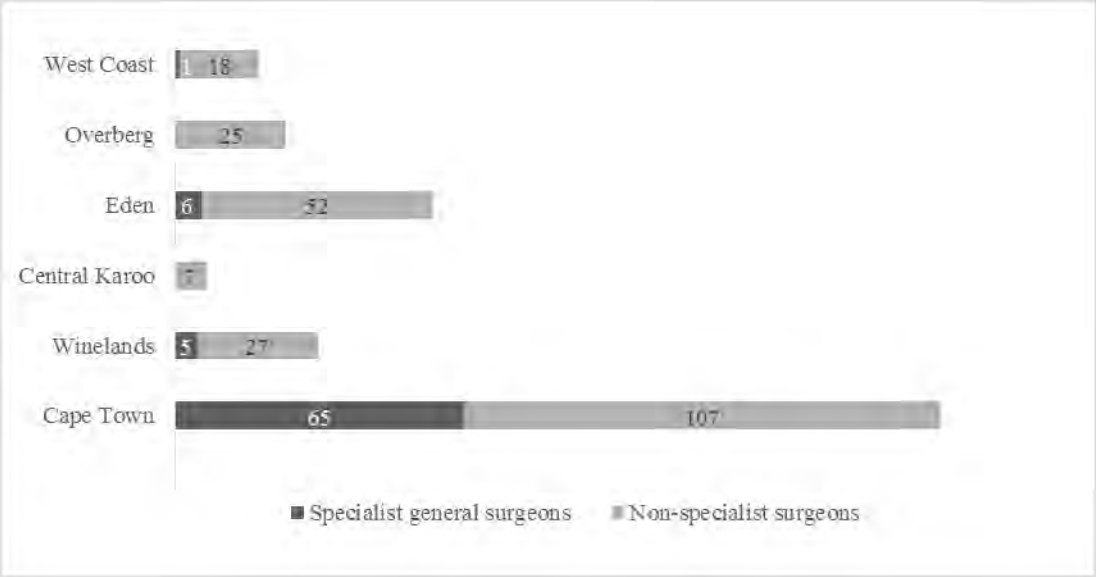


Figure 52: Western Cape public specialist and non-specialist general surgeons by district.

Table 130: Western Cape private hospitals with total hospital beds, surgical beds and theatres.

Region	Owner	Hospital	Usable beds	Surgical beds	Theatres
Cape Town	Independent	Broad Road Surgical clinic	27	27	4
Cape Town	Melomed	Bellville	123	58	4
Cape Town	Mediclinic	Cape Gate	140	45	5
Cape Town	Mediclinic	Cape Town	125	37	5
Cape Town	Netcare	Christiaan Barnard Memorial	248	72	14
Cape Town	Life	Claremont	88	33	4
Cape Town	Mediclinic	Constantiaberg	238	36	8
Cape Town	Mediclinic	Durbanville	210	89	8
Cape Town	Melomed	Gatesville Medical Centre	133	40	1
Cape Town	Life	Kingsbury	138	21	11
Cape Town	Netcare	Kuilsriver	182	71	5
Cape Town	Mediclinic	Louis Leipoldt	190	70	7
Cape Town	Mediclinic	Milnerton	139	60	5
Cape Town	Melomed	Mitchells Plain	132	22	5
Cape Town	Independent	Monte Vista Clinic	24	24	3
Cape Town	Netcare	N1 City	225	104	7
Cape Town	Mediclinic	Panorama	400	200	12

Table 130 continued: Western Cape private hospitals, beds, surgical beds and theatres.

Region	Hospital type	Hospital	Usable beds	Surgical beds	Theatres
Cape Town	Mediclinic	Strand	24	14	2
Cape Town	Mediclinic	Vergelegen	237	106	7
Cape Town	Life	Vincent Pallotti	273	64	12
Cape Town	Mediclinic	Ceres	28	6	1
Cape Winelands	Independent	Groenleegte Paarl	21	11	3
Cape Winelands	Mediclinic	Paarl	143	37	5
Cape Winelands	Mediclinic	Stellenbosch	114	47	4
Cape Winelands	Mediclinic	Worcester	187	65	5
Central Karoo		nil			
Eden	Life	Bayview	108	10	2
Eden	Independent	Cango Clinic	14	14	2
Eden	Mediclinic	George	122	65	5
Eden	Mediclinic	Klein Karoo	38	10	2
Eden	Life	Knysna	49	15	2
Eden	Mediclinic	Plettenberg Bay	27	12	1
Eden	Mediclinic	Hermanus	80	37	3
Overberg	Netcare	Blaauwberg	104	26	5
West Coast	Life	West Coast	60	12	2
	Total	34	4 391	1 560	171

Table 132: Western Cape private hospital number and total bed number by region - comparative between 2007 HST data and 2014.

Region	Private hospitals 2007	Private hospitals 2014	Private beds 2007	Private beds 2014
Winelands	5	4	609	465
Central Karoo	0	0	0	0
Cape town	30	21	3 026	3 324
Eden	5	7	387	438
Overberg	1	1	45	104
West Coast	1	1	44	60
Total	42	34	4 111	4 391

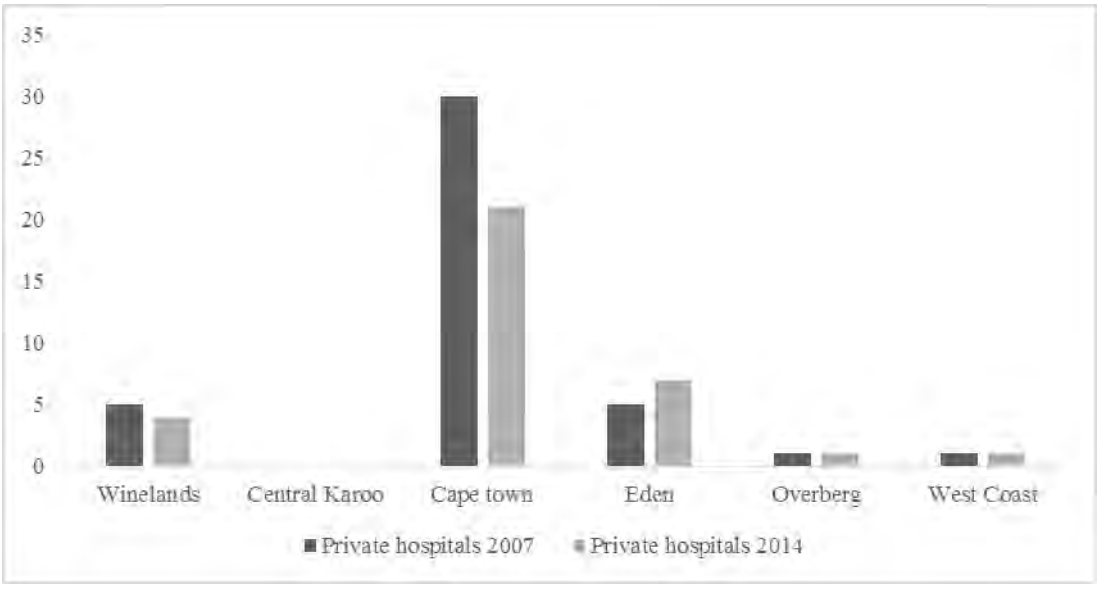


Figure 53: Comparative between Western Cape private hospital number for 2007 and 2014.

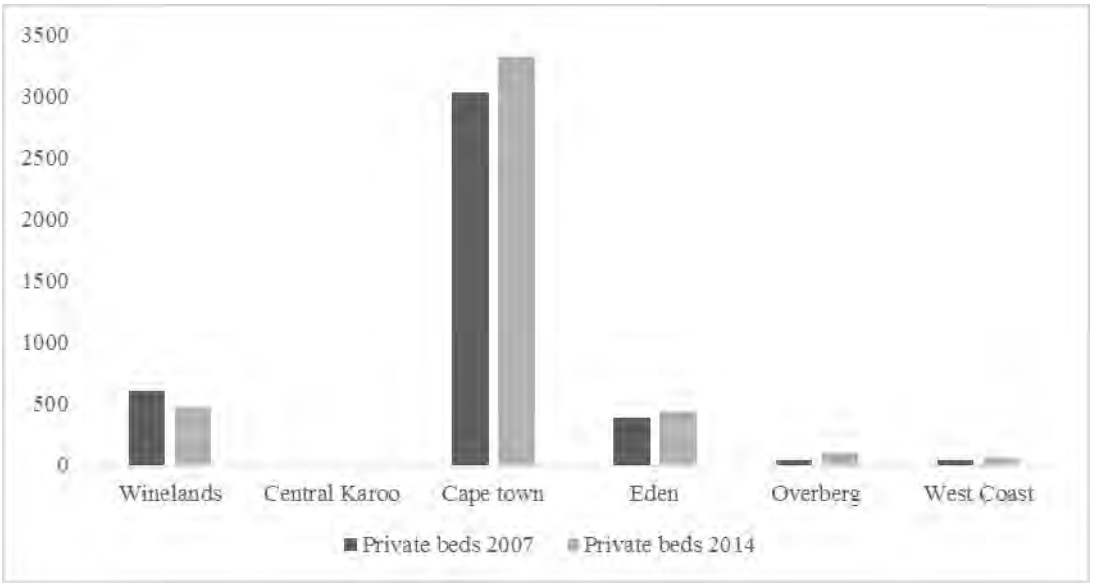


Figure 54: Comparative between Western Cape private hospital bed number for 2007 and 2014.

20.16 **Appendix P:** Chapter 14 Figures and Tables (Private Hospitals)

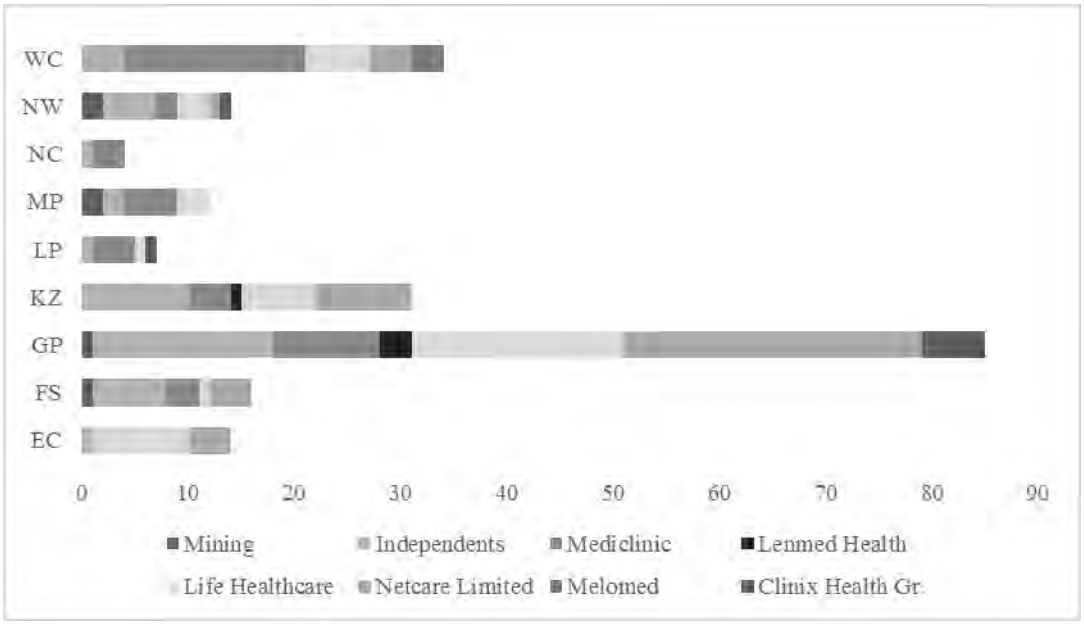


Figure 55: Private hospitals according to province and hospital group.

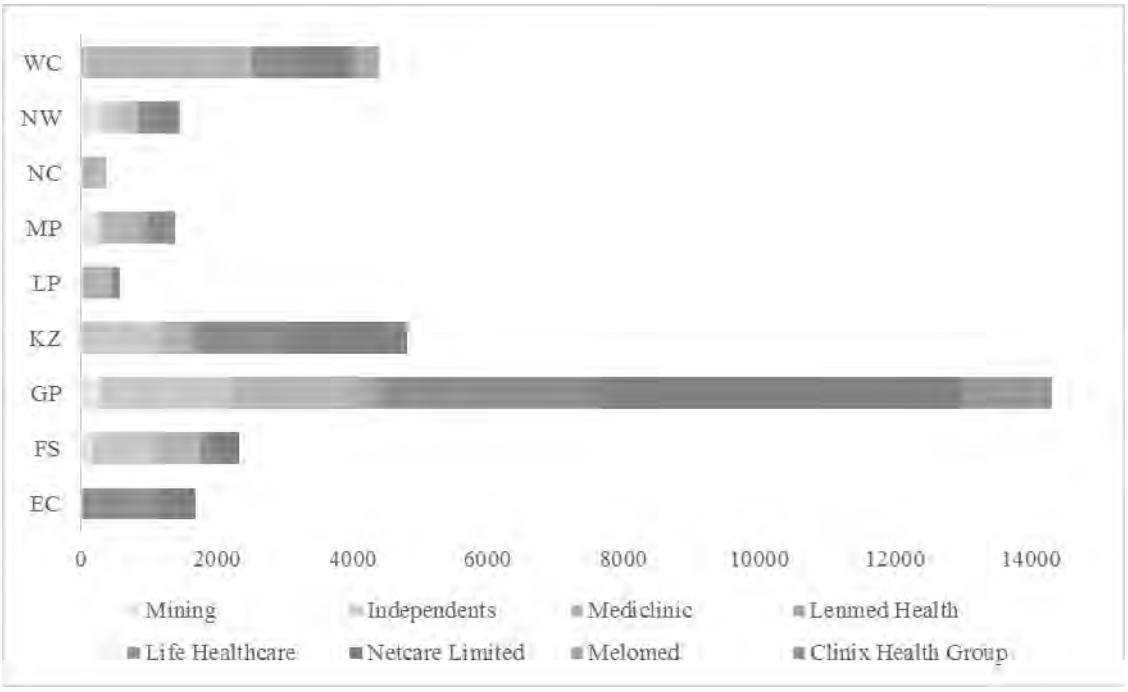


Figure 56: Private hospital beds according to hospital group.

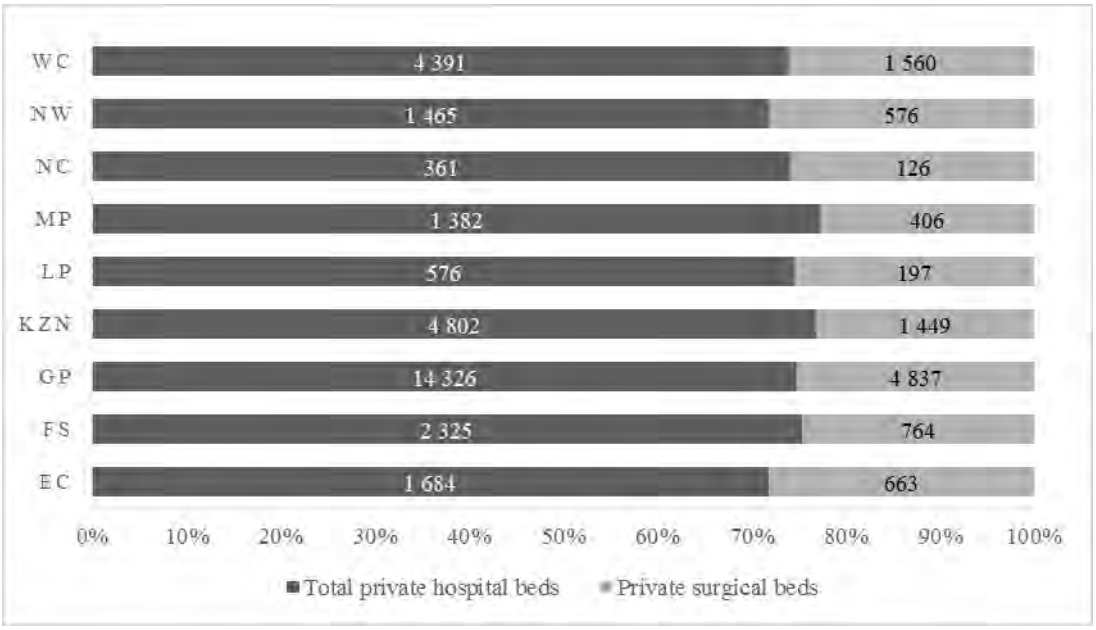


Figure 57: Private hospital surgical beds as a proportion of total hospital beds.

Table 138: Private hospital surgical beds according to hospital group.

Hospital group	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
Mining	0	54	93	0	0	74	0	117	0	338
Independents	10	303	731	269	6	28	10	119	76	1 552
Mediclinic	0	248	492	123	150	193	116	62	936	2 320
Lenmed Health	0	0	100	34	0	0	0	0	0	134
Life Healthcare	405	50	1 184	449	24	111	0	173	155	2 551
Netcare Ltd.	248	109	2 010	574	0	0	0	60	273	3 274
Melomed	0	0	0	0	0	0	0	0	120	120
Clinix Health	0	0	227	0	17	0	0	45	0	289
Total	663	764	4 837	1 449	197	406	126	576	1 560	10 578

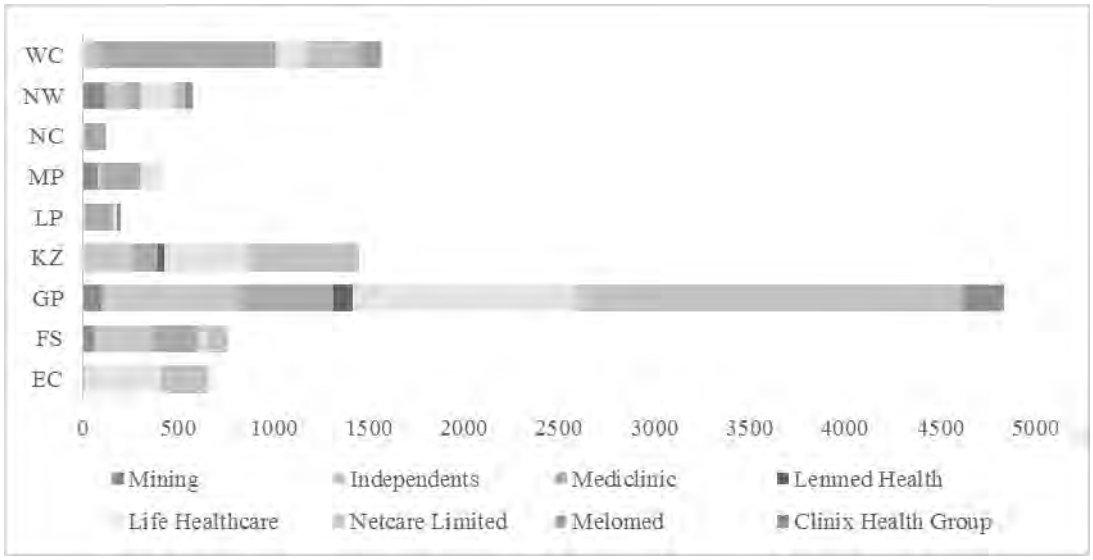


Figure 58: Private hospital surgical beds according to hospital group.

Table 141: Private hospital operating theatres according to hospital group.

Hospital group	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
Mining	0	3	4	0	0	3	0	3	0	13
Independents	0	13	79	34	1	4	1	13	12	157
Mediclinic	0	23	69	17	13	19	11	7	85	244
Lenmed	0	0	9	3	0	0	0	0	0	12
Life	39	10	128	47	2	13	0	14	33	286
Netcare Ltd.	24	11	190	61	0	0	0	5	31	322
Melomed	0	0	0	0	0	0	0	0	10	10
Clinix	0	0	21	0	2	0	0	3	0	26
Total	63	60	500	162	18	39	12	45	171	1 070

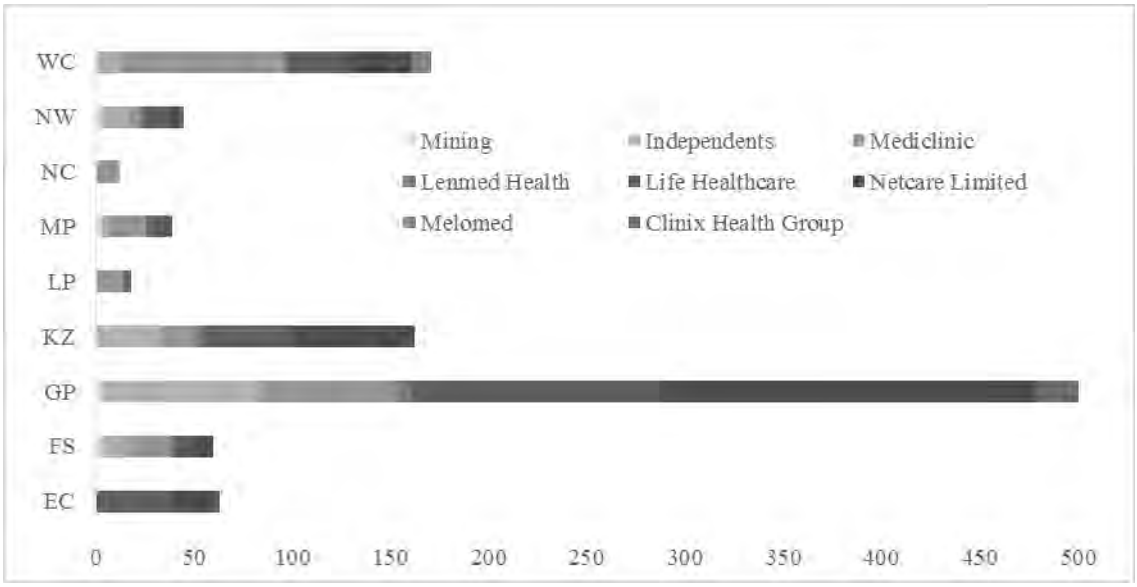


Figure 59: Private hospital theatres according to ownership.

20.17 **Appendix Q:** Chapter 18 Tables (Discussion)

Table 148: Average number of surgical resources in South Africa, according to hospital level.

Hospital level	Hospital beds	Surgical beds	SP general surgeons	NSP general surgeons	Theatres
District	131	21	0.1	3	1
Regional	471	86	2	5	5
Central	762	144	12	21	13

Table 149: Distribution of total hospital beds per 100 000 for 1993 (HNYB), 2007 (HST) and 2014.

Province	Total hospital beds 1993	Beds per 100 000 1993	Total hospital beds 2007	Beds per 100 000 2007	Total hospital beds 2014	Beds per 100 000 2014	Difference (1993 - 2014)	% Change in beds
EC	23 157	350	14 909	225	12 517	184	-10 640	-45
FS	11 493	410	6 452	230	6 042	216	-5 451	-47
GP	41 297	600	29 465	415	29 181	225	-12 116	-29
KZN	32 826	380	29 376	333	22 889	214	-9 937	-30
LP	12 846	250	9 509	169	7 817	138	-5 029	-39
MP	6 058	210	5 097	170	6 174	123	116	2
NC	3 090	400	2 033	290	2 015	172	-1 075	-35
NW	11 518	330	6 580	199	4 877	132	-6 641	-57
WC	19 949	540	13 928	376	10 717	175	-9 232	-46
RSA	161 949	404	117 349	296	102 229	186	-59 720	-36

Table 150: Distribution of public hospital beds per 100 000 for 1993 and 2014.

Province	Public hospital beds 1993	Beds per 100 000 1993	Public hospital beds 2014	Beds per 100 000 2014	Difference (1993 – 2014)	% Change in beds
EC	14 520	220	10 833	159	-3 687	-25
FS	6 160	220	3 717	133	-2 443	-39
GP	17 040	240	14 855	115	-2 185	-12
KZN	22 000	250	18 087	169	-3 913	-17
LP	11 200	200	7 241	128	-3 959	-35
MP	4 500	150	4 792	95	292	6
NC	1 540	220	1 645	141	105	6
NW	6 930	210	3 412	92	-3 518	-50
WC	8 510	230	6 326	103	-2 184	-25
RSA	86 992	220	70 917	129	-16 075	-18

Table 21: Surgical bed number per province.

Hospital	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
District	793	559	428	1 670	715	605	146	220	455	5 591
Regional	152	336	1 176	1 522	235	132	146	407	210	4 316
Central	945	60	848	354	130	107	0	0	509	2 953
Public	1 890	619	2 452	3 192	1 080	844	292	627	1 174	12 170
Private	663	764	4 837	1 459	197	406	126	576	1 560	10 578
Total	2 553	1 383	7 289	4 651	1 277	1 250	418	1 203	2 734	22 758

Table 151: Functional operating theatres per 100 000 by province.

Province	Public theatres per 100 000	Private theatres per 100 000	Total theatres per 100 000
EC	1.74	0.93	2.67
FS	2.33	2.15	4.49
GP	1.63	3.87	5.50
KZN	1.71	1.51	3.23
LP	1.12	0.32	1.43
MP	1.20	3.34	1.98
NC	1.45	1.02	2.48
NW	1.25	1.22	2.47
WC	2.22	2.81	5.01
RSA	1.64	1.95	3.59

Table 152: Private sector hospital bed number comparison between data collected during 2006 (HASA), 2007 (HST), 2010 (Stats SA) and updated 2014 data.

Province	2006 private hospital beds (HASA)	2007 private hospital beds (HST)	2010 private hospital beds (Stats SA)	2014 private hospital beds
EC	1 365	1 488	1 723	1 684
FS	2 443	2 094	2 337	2 325
GP	12 909	14 157	14 278	14 326
KZN	3 402	3 752	4 514	4 802
LP	655	359	600	576
MP	928	923	1252	1 382
NC	992	325	293	361
NW	670	1 039	1 685	1 465
WC	4 268	4 111	4 385	4 391
RSA	27 632	28 248	31 067	31 312